

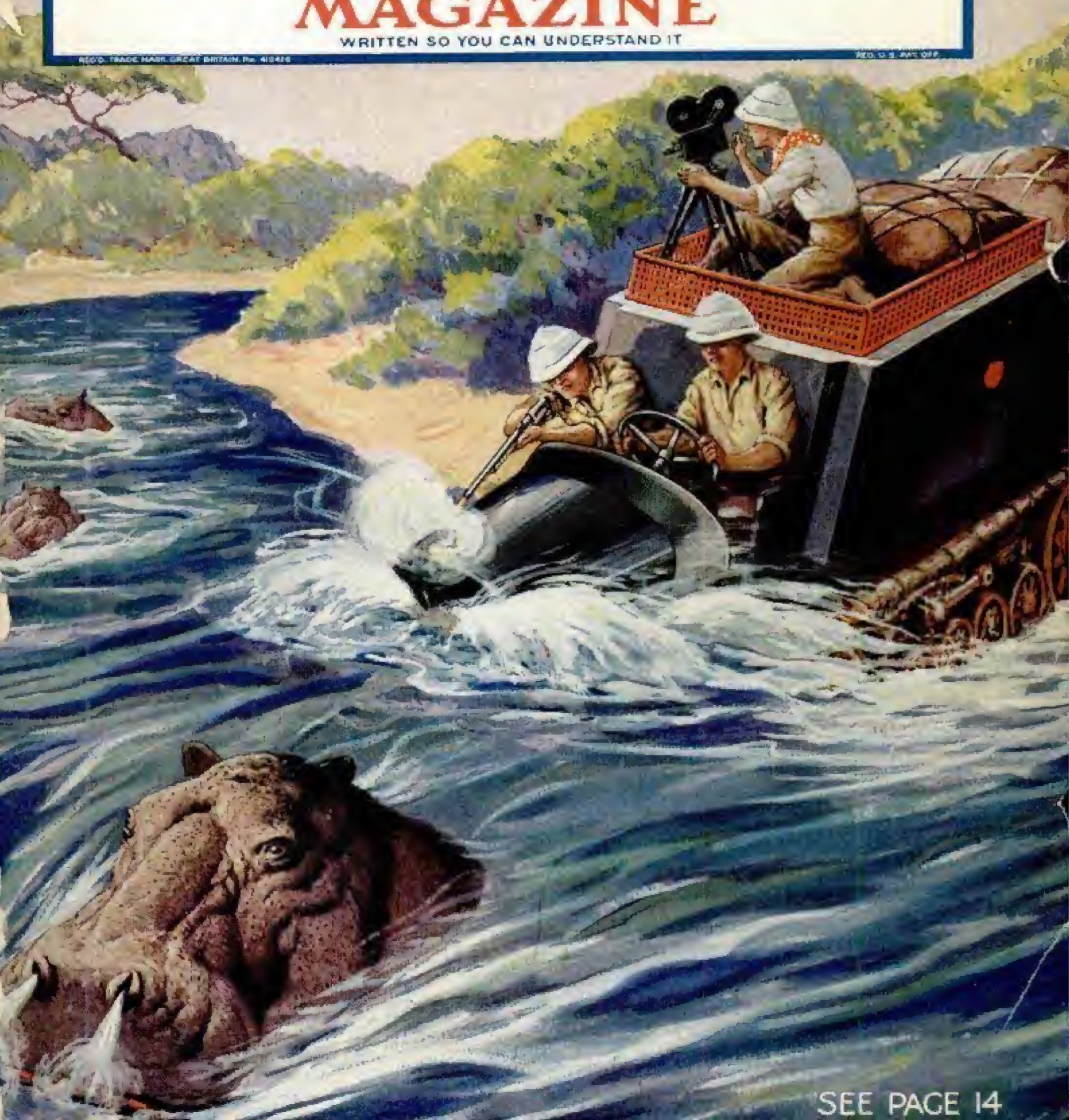
POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG'D. TRADE MARK GREAT BRITAIN No. 418418

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SEE PAGE 14

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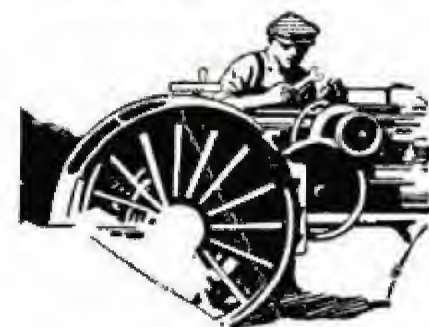
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WD-11	\$2.50
WD-12	\$2.50
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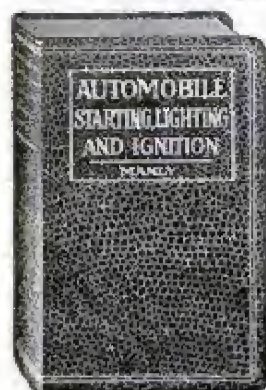
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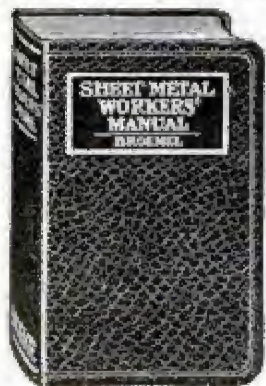
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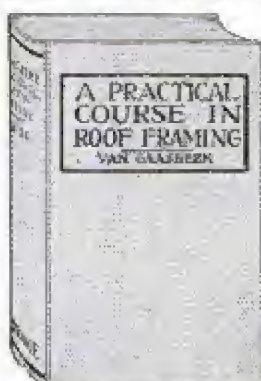
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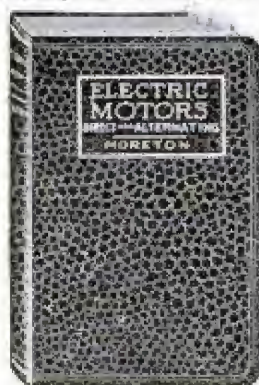
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More recently he writes as follows: "Monthly dividends are being paid me on my investment in LaSalle training in the form of increased salary at a rate in excess of 125% per month."

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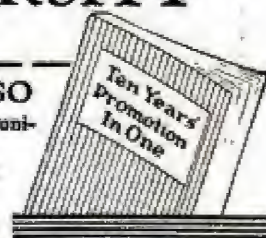
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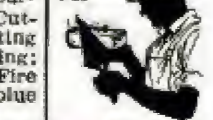
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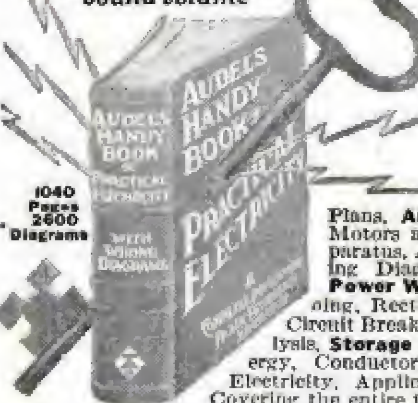
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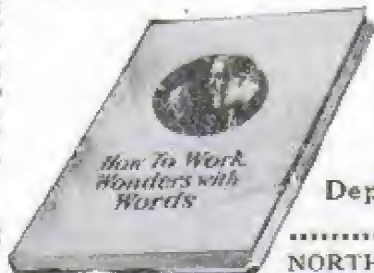
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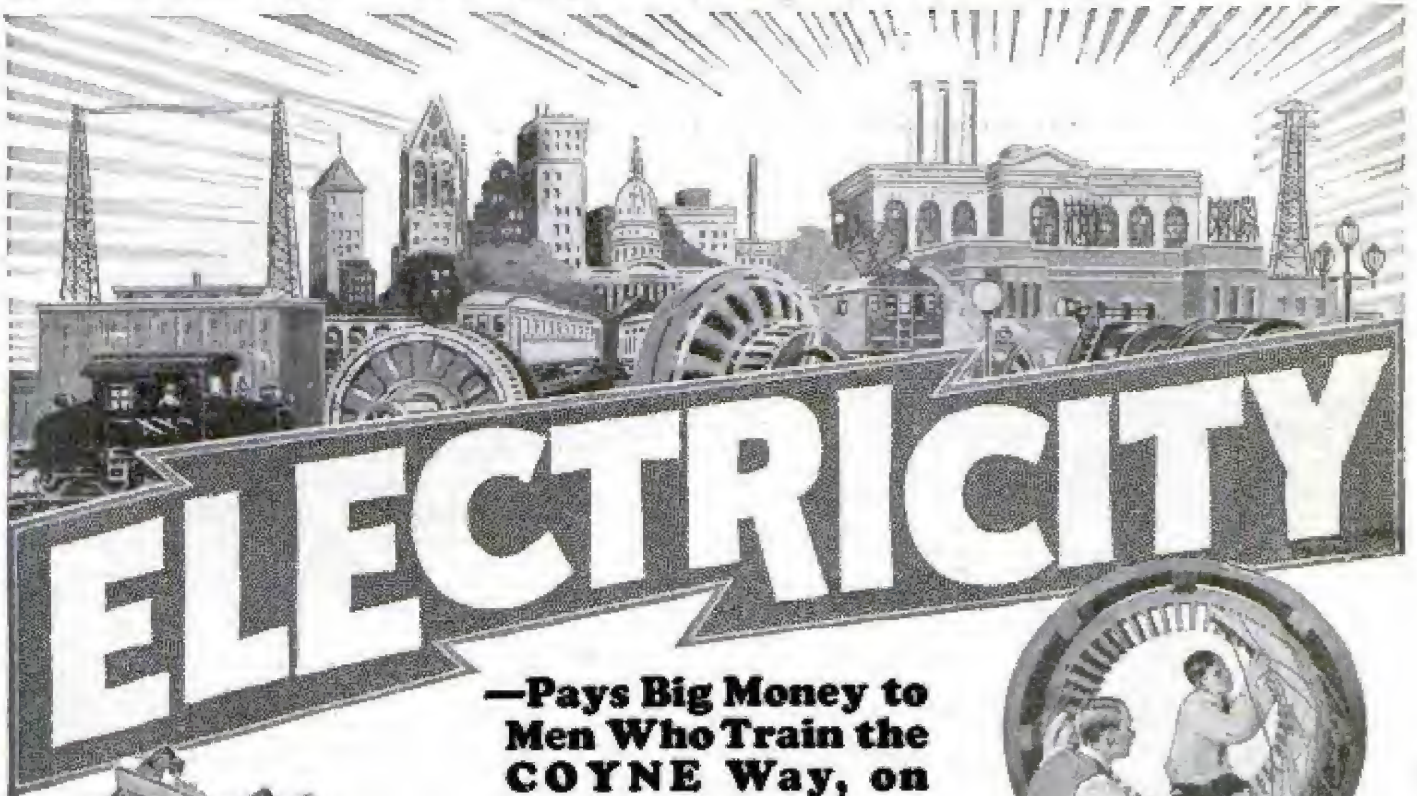
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3

because I train you by the Job-Method

These pictures show how my students learn Electricity by doing actual Electrical jobs with standard materials and tools which I supply without extra cost. Four costly outfits given! Students make fast progress by this wonderful Job-Method. Many do similar jobs for pay in their spare time and earn more than enough to pay for this training.

Small Monthly Payments

Our educational standards are high, tuition is within reach of the untrained man who needs this training, and small monthly payments accepted. So you need not face the world without training—let me show you how to get this million dollar No-Profit institution back of you in your fight for success and independence.

Get My JOB AND RAISE Contract—Quick!

Now you can put your time and money into home training with a positive agreement that it will lead to a better job and increased pay. Get the facts about my amazing offer. Find out about the opportunities and jobs waiting for you in Electricity. Act quick and make the next few months the turning point in your life. Coupon brings complete information.

CHIEF ENGINEER DUNLAP, Electrical Division
AMERICAN SCHOOL, Dept. E-174
Drexel Ave. & 58th St., Chicago

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The first two free outfits prepare you to do Wiring Jobs like these.

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Author of "Science of Wrestling," "Muscle Building," "Secrets of Strength," and "Here's Health," etc.

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Can you squat down and sit on your heels without hearing a crack in your knees or a stiffness around the joints? Can you bend over slowly without bending your knees and place the open palms on the ground alongside of your feet? Can you place your hands on the wall behind you and gradually let yourself down backwards till your hands touch the ground? If not, your joints are rusty, your tendons are too tight—you need more bone-oil.

What is Bone-Oil?

When you were born, nature gave you a lubricating fluid in and around the socket of every joint. This lubricating fluid continued in an abundant supply as long as you kept active. But when you ceased to exercise, this fluid lessened and the tendons shortened which attached the muscles to your bones. You dried up and stiffened. You became rusty.

When machinery becomes rusty we get the oil can. But you can't squirt Bone-Oil into your joints. What then can you do?

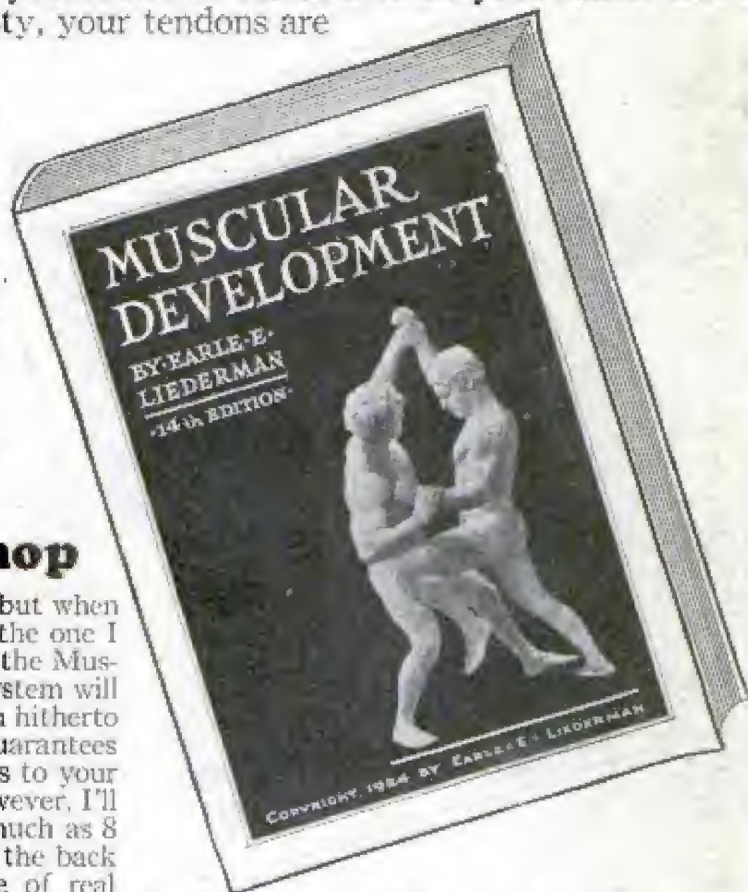
Come to My Repair Shop

As a regular machinist I'm a first class dub—but when it comes to human frame-work, I'm yet to find the one I can't whip into shape. Yes, I know they call me the Muscle Builder, and I'm proud of the fact that my system will build more muscle in a shorter length of time than hitherto has ever been accomplished. I'm the man who guarantees to add one full inch to your arms and two inches to your chest in the first 30 days. Before I'm through, however, I'll at least triple that. Some men have added as much as 8 inches to their chests. In every case I build up the back and literally cover the abdomen with a ripple of real healthy muscle. I clear the brain and brighten the eye.

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You take no chances with me. It's a sure bet, so why hesitate? Snap into it. Let's go.

Send for my free 64 page book



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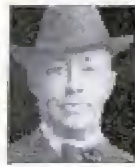


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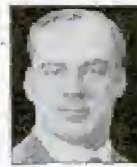
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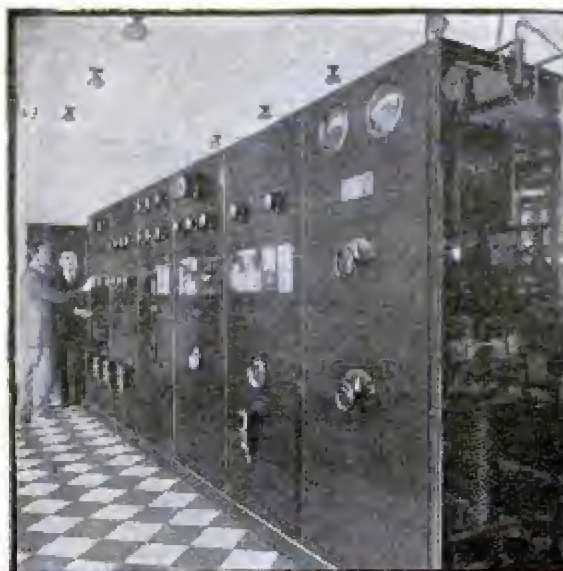
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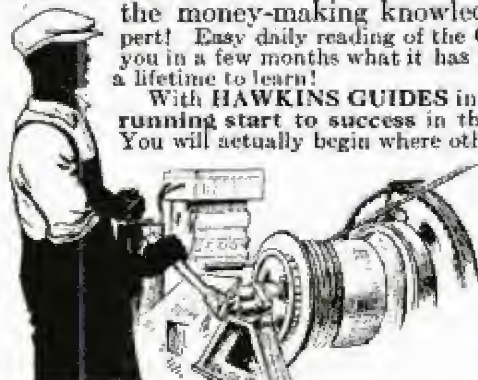


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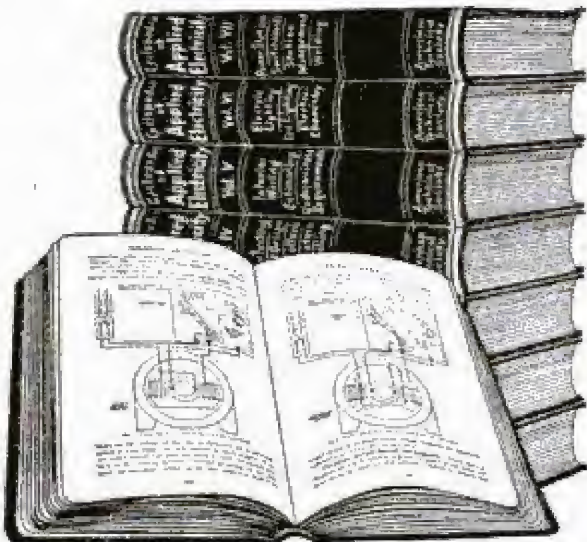
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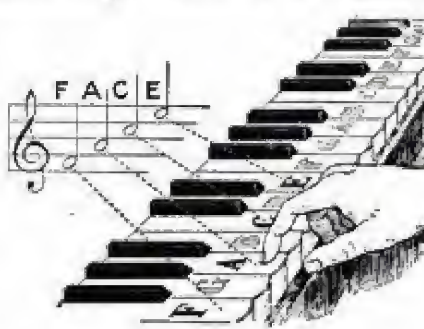
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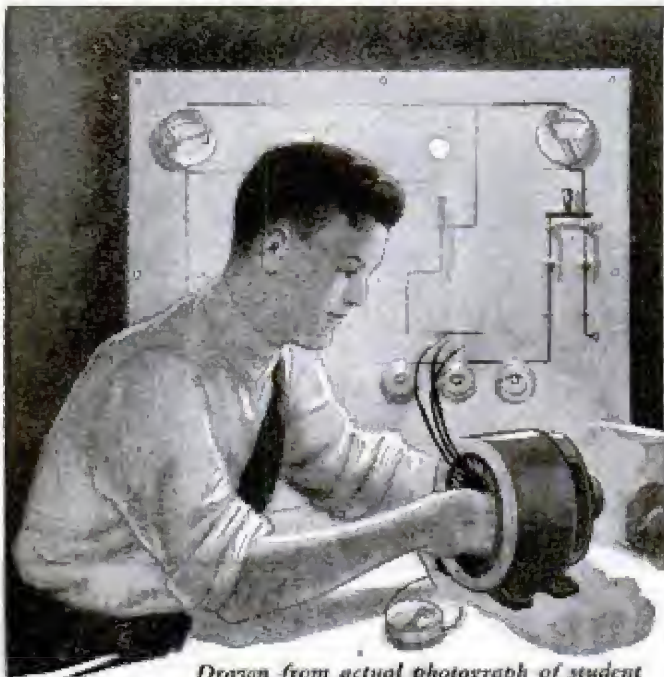
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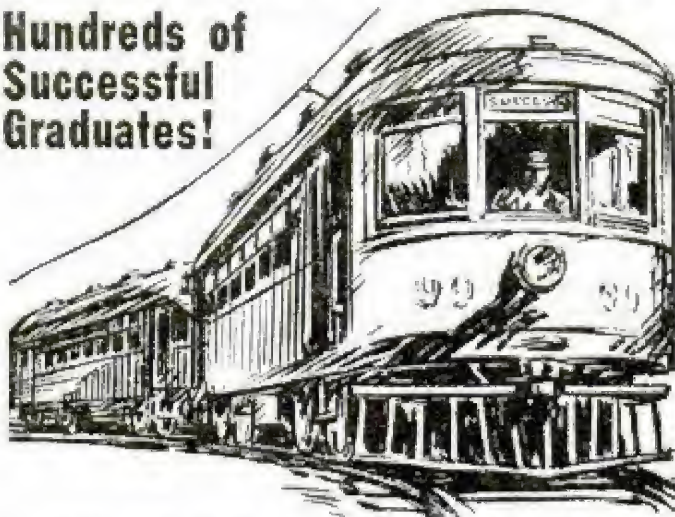
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have increased my salary
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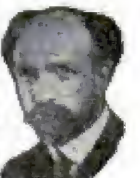
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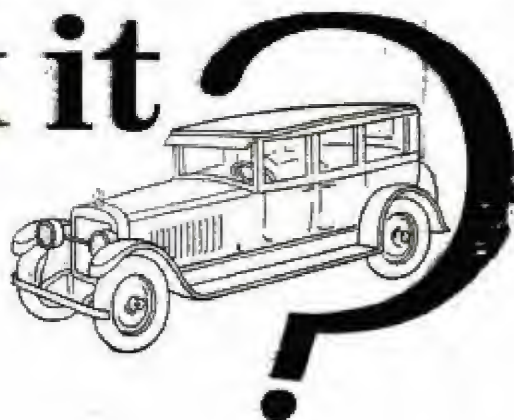
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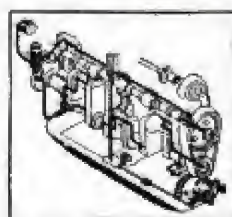
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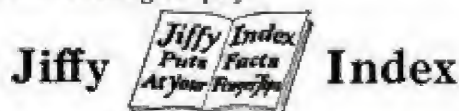
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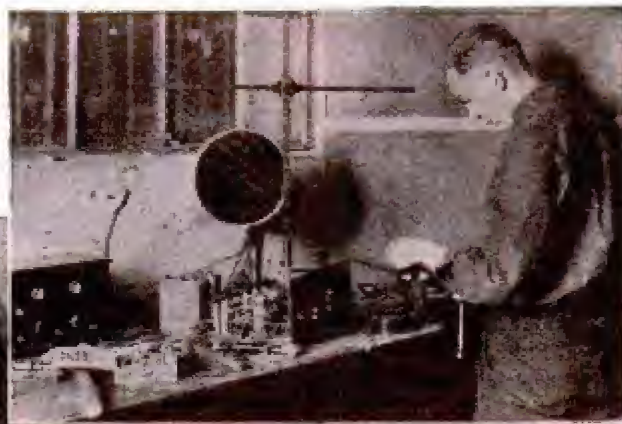
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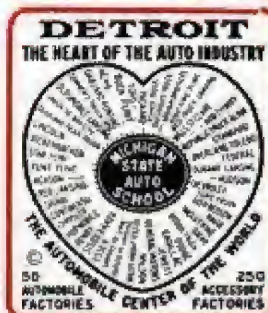
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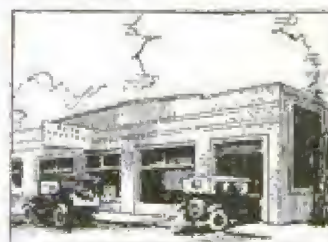
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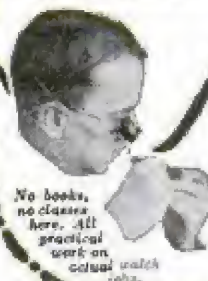
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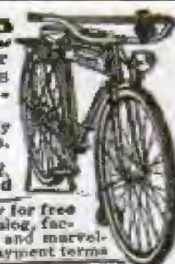
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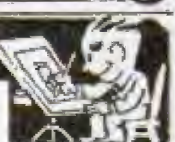
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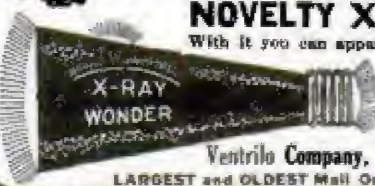
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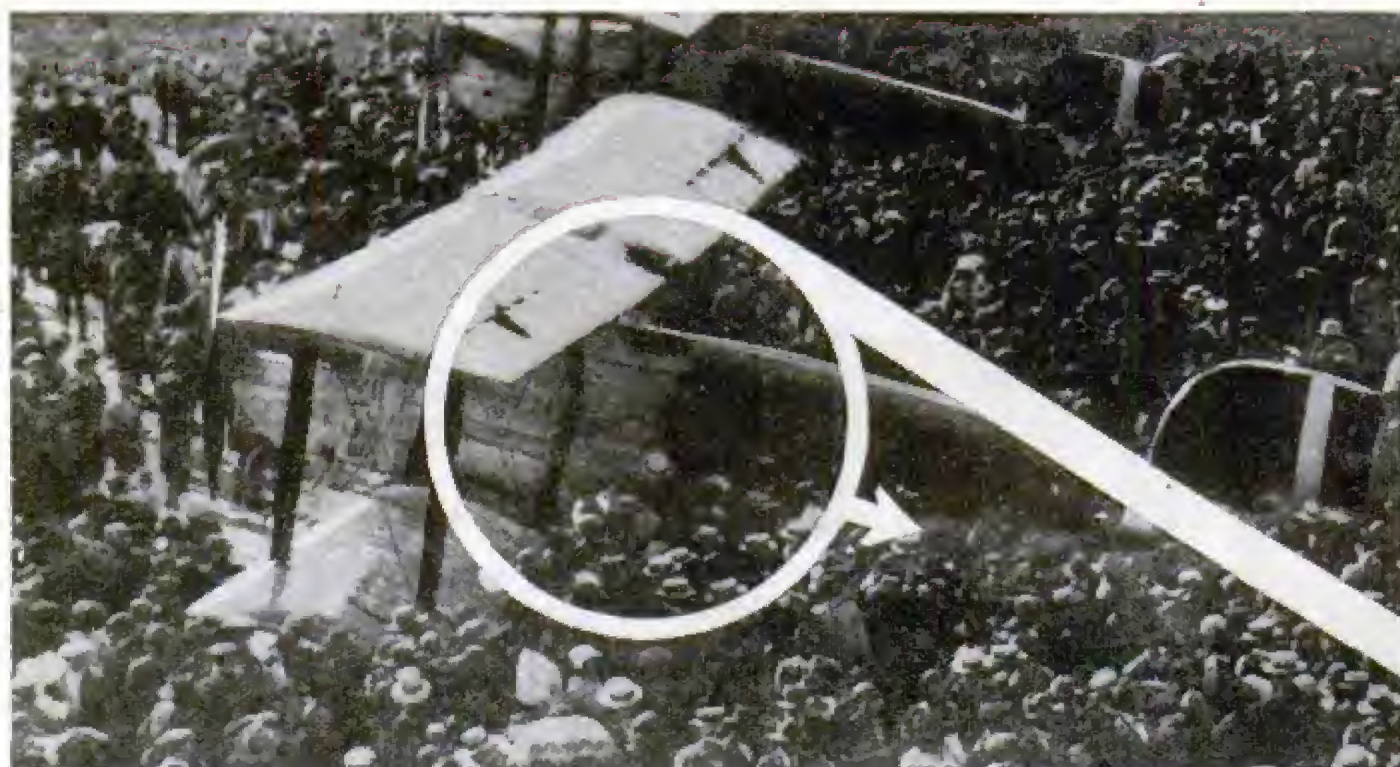
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That's the secret of the success of the American-trained student. They learn from practical skilled men who know the flying game from A to Z. These experts guide you carefully through your training, step by step. They select your lessons, blue prints, bulletins, etc. They give you all the inside facts and details that are essential to your success. Every lesson is clearly explained and easy to understand—and they are always glad to answer special questions and help you in every way possible.

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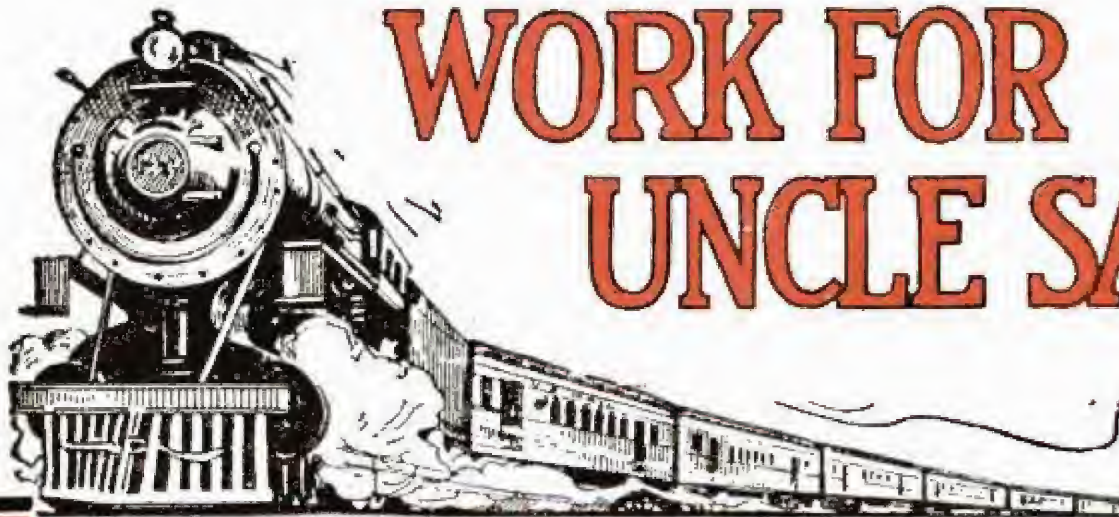
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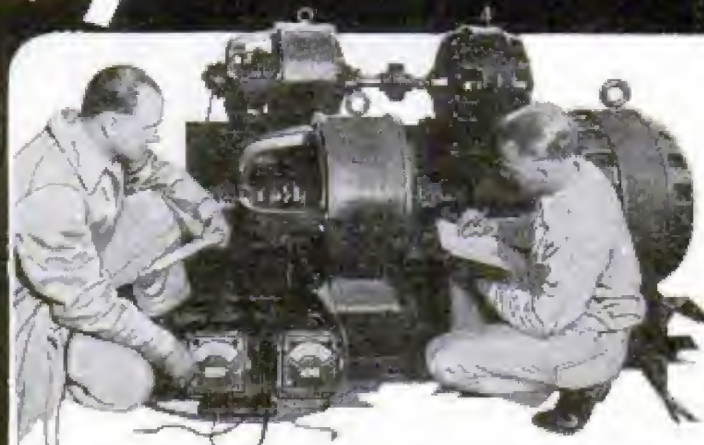
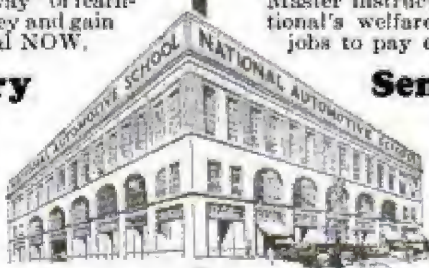
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A Field of Unlimited Opportunities

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"Words cannot express my appreciation of the LaSalle course in Traffic Management. I knew absolutely nothing about rates, fares, claims, railway accounting, classifications, etc. After graduating, I went into the Accounting Department of one of the largest railroads in the state, and from there I went with one of the largest motor manufacturers in Detroit, taking full charge of all claims, revision and auditing of freight charges. After two years I resigned and went with the largest paper company in the United States. In June, 1921, I resigned my position and went into the motor truck business. I started with an investment of \$1,000. Today I own about \$50,000 worth of equipment, and, to say the least, I have made good. Your course places a man in position to accomplish anything he wishes along the lines of training."

Traffic Management is a field of unlimited opportunities. Whether you want to go higher where you are, get a position elsewhere, or go into busi-

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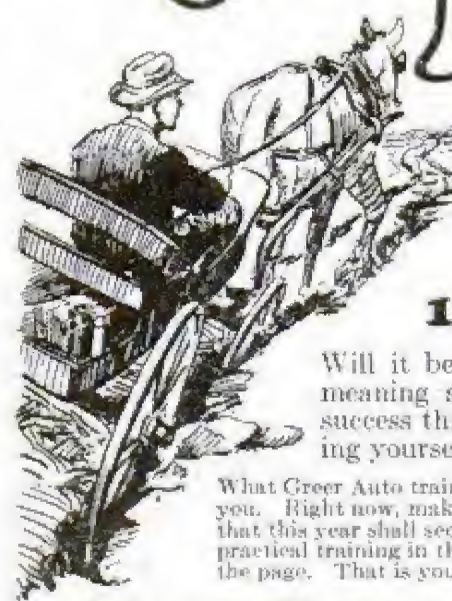
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What Greer Auto training has done for thousands of men it will do for you. Right now, make the biggest New Year's resolution of your life—that this year shall see you far along on the road of success—thanks to practical training in the Greer Shops. Mail the coupon at the bottom of the page. That is your first step.



The 7 story home of the
Greer Shops

More Men are Needed in the Auto Business than ever before

You couldn't possibly choose a better time to get into the auto trades. With over 20,000,000 cars in operation in the United States, there are not nearly enough men who really know how to keep them in shape. Why don't you be the man who knows and get into the big pay class? Learn the right way and be able to boss the job. You can soon go into business for yourself if you wish and build a good paying business from a small start.

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The Greer Shop plan is the practical, sensible way to learn this business thoroughly and quickly. You need not know a tail light from a spark plug, to start with; yet in a very short time you will master the knowledge and the tricks that make you a valuable man. The training you get here will start you into any branch of the auto, truck or tractor business.

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The Greer shops have been training men practically as long as the automobile business has been in existence. Erwin Greer started this institution in 1902 and has been in active charge ever since. He knows from real experience how to help you get to the top and get the big pay. Although the school has grown tremendously, Mr. Greer keeps up his personal interest in the welfare of every student. In fact, the helpful comradeship of all the instructors is an important feature of the Greer shops.

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There are from 75 to 100 customers' cars in the Greer shops at all times. Actual work on their cars, with the help of expert instructors, gives you the real inside knowledge of the business. When you finish this training you will know how and you will know why. That's the reason Greer trained men are always in demand.

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10,000 FORMULAS. A real Gold Mine of money-making ideas. Tells how to make almost everything under the sun. You can make and sell cosmetics, muckage, anti-freeze solutions, battery solutions, beverages, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, blueing, leather polish, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send No Money, just write a postal and ask for Henley's 20th Century Book of Formulas. When the postman hands you the book, pay the few cents postage and \$1. Money back if you are not delighted. Popular Mechanics Press, 200 E. Ontario St., Room 801, Chicago, Ill.

AGENTS WANTED

NO Dull Times in the Food Business. Selling Federal Pure Food Products is the greatest, surest and safest business in the world today, and here is your opportunity to get into it. You can make \$3,000, \$5,000, \$10,000, or more per year—the only limit is your ability to take care of the business. You will need no experience or money to get into this business. Your \$20.00 starting order sent on trust. We teach you everything you need to know. We furnish you with license, No Dull Times, for the People Must Eat, and our food products are the fastest selling, surest and quickest repeat order goods in the world. Sell on sight in every home where food is used—repeat orders immediately and every week thereafter. A real big business all your own. Every new customer adds a great deal to your weekly income. Your business once established, has a market value just like a store and can be easily sold. The greatest money-making opportunity of your lifetime because you risk absolutely nothing, as we guarantee your sales, and we will not let you fail. Remember! Guaranteed! Best products, biggest sellers, surest repeat orders. No capital or experience is required. We furnish capital and everything necessary for you to become a Federal Distributor. Exclusive territory will be given honest men or women who write at once. Federal Pure Food Company, 2309 Archer Avenue, Dept. A, Chicago, Ill. Largest packers of Pure Food specialties in the world. Reference, any bank, Dun or Bradstreet rating agency, Express or Railway Company in America.

DISTRICT Agents—For Union Made pure wool suits and topcoats retailing at \$23.50, none higher. A remarkable line of 45 beautiful fabrics tailored by a large and well known old established firm, sold only thru our own stores and district agents. A real opportunity for any good man. Big money to start and chance for advancement. We furnish large sale outfit, 9x13 cloth samples. Men over 30 years of age with tailoring or clothing experience preferred. Can use ambitious spare time men in smaller towns. Interested only in serious men who seek a future. Write for free samples and full information. Address M. V. Harvey, Mgr., Box 00, Chicago.

DISTRICT Agents—For Union Made pure wool suits and topcoats retailing at \$23.50, none higher. A remarkable line of 45 beautiful fabrics tailored by a large and well known old established firm, sold only thru our own stores and district agents. A real opportunity for any good man. Big money to start and chance for advancement. We furnish large sale outfit, 9x13 cloth samples. Men over 30 years of age with tailoring or clothing experience preferred. Can use ambitious spare time men in smaller towns. Interested only in serious men who seek a future. Write for free sample and full information. Address M. T. Harvey, Mgr., Box 00, Chicago.

I WANT a Partner-Agent to take care of my business in your town. I furnish everything including the world's finest line of 175 household products, and split the total selling price with you 50-50. Beautiful sample outfit makes selling easy. Toilet Preparations, Food Products, etc. Highest quality—lowest prices—quick sales—permanent repeat business. I pay largest commissions in this line and offer free Chrysler or Hudson Coach besides. Get my amazing offer quick. Address me personally. Sidney F. Mills, Director of Sales, Heathco-Products Co., Dept. AK-1, 117 Duane St., Cincinnati, Ohio.

WHAT Are you seeking? Are you tired of being tied where you realize no increase in your returns from year to year? We want men who really want to build into a good, sound, growing business for themselves. Men of character who will honestly hustle for just and liberal and ever-increasing returns. Men who merit real co-operation from company of world-wide reputation and established integrity. All negotiations confidential—write Business Promotion Manager, 650 N. Meridian St., Indianapolis, U.S.A.

BIG Money Selling "Jiffy Tire & Tube Repair Kit." Contains 3 Self-repairing Tire Shoes; Large Outfit Tube Patch; 3 Puncture sealers, everything complete. Sells to every auto owner and Accessory Dealer. Agents average \$80 to \$100 weekly. We also manufacture Nationally known "Jiffy Tire-Doh." Exclusive territory and free samples. Chicago Tire Patch Co., 347-65 E. 55th St., Chicago, Ill.

FREE—Get This Quick! Chicago's Wonder Shirt line. Sell newest, stylish, snappy, Stylenor Shirts. Amazing values at low prices. Make \$100.00 weekly easy. Complete assortment of large swatches makes selling Stylenor Shirts a pinch. Experience or capital unnecessary. Be your own boss. We will show you how to build a big business of your own. We will deliver and collect. Exclusive territory open. Write today, for big free outfit. Stylenor, 81 W. Van Buren, Chicago, Ill. Dept. 1000.

SALESMEN wanted in exclusive territories by an old established concern, to call on factories, hospitals, schools, department stores, institutions, cemeteries and public buildings. Wonderful advertising co-operation. Proposition will pay from four to ten thousand a year to right man. C. B. Dodge Company, Westport, Conn., Sales Department.

AGENTS—Why Work for Others? Make Fastest selling Auto Supplies yourself: Gas Tablets, Anti-Freeze, Auto Polish, Carbon Remover, Radiator Cement, Magic Windshield Compound, Tire Repairs, Etc. Few dollars buys ten Secret Formulas. Complete instructions and all materials. Mixing easy. No special equipment. Enormous Profits from start. Write for details. General Motor Supply Co., Box 102, LaCrosse, Wis.

AGENTS! Amazing Liquid Thread darning sealer, stronger, in one-tenth ordinary time. Mends all fabrics invisibly! Stands washing, boiling, ironing, 50c tube. 32c profit. Men sell 100 daily. Make \$3.20 on every \$5. Amazing money maker. Facts Free. Write New Way Laboratories, Dept. A-100, Mt. Healthy, Ohio.

PENNANTS and Pillows: Colleges, Schools, Clubs, Lodges, Students and agents get busy. American Pennant Co., 66 Hancock St., Boston, Mass.

TAKE orders for Shirts and Overalls. Big profits. Work full or spare time. No experience required. Big variety dress shirts with splendid line Union-made work and flannel shirts, overalls, coveralls, work pants, sheep-lined coats, leather coats and vests. Write today for free selling outfit. The Nimrod Shirt Co., Dept. 8, 1922-24-26-28 Lincoln Ave., Chicago.

GIVE Away finest laundry soap Free. You'll make \$10 daily easy by new selling plan. Big repeat business. Write quick. Wolverine Soap Co., 28 Wolverine Bldg., Grand Rapids, Mich.

BIG Money monogramming autos, trunks, bags, etc. Make \$20 to \$25 daily. No experience needed. Samples, information free. Acme Products, 995 Broad, Newark, N. J.

CREATE Mail Order or Local Business. New Simple Plan Gets Money—Easily, Quickly, Steadily, Surely. Particulars Free. Edw. Burke, 733 Nineteen, Oakland, Calif.

REPRESENT National Real Estate Organization in your district. Particulars upon request. Large earnings possible, experience not essential. V.L.C.O., 987 Union Trust Bldg., Pittsburgh, Pa.

MAKE 16,000 miles without a puncture. Inside Tyres positively prevent punctures and blowouts. Double tire mileage, any tire, old or new. Use over and over again. Low priced. Agents wanted. Write for terms. American Accessories Co., Dept. 378, Cincinnati, Ohio.

\$2.00 EVERY hour you work. Wonderful opportunity to build permanent, profitable repeat business. Demand big for our guaranteed every day household necessities. Sales plans and free premium offers make Sales easy. Million dollar organization. Established 17 years. Write for Samples, particulars. Furst-McNess, Dept. PM, Freeport, Ill.

AGENTS—Can earn \$100.00 and upwards weekly, selling the Gold Medal five-tube Tuned Radio Frequency set at \$25.00. "The Set that stormed the country," built for the home of moderate means. The Farmer, Clerk, Laborer and Lady of the home ought to buy it on sight. Write today for proposition and exclusive territory. Eureka Outlet Corp., Desk PM, 798 Southern Blvd., New York City.

275,000 ARTICLES at Wholesale. Where to buy everything at rock bottom prices. Latest most complete directory published. Postpaid \$1. Circular Free. Harriman Trading Company, Dept. PD, 162 East 23rd Street, New York City.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for Free book "How to Obtain a Patent" and Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, 5899 Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 142 and 143.

WHIRLWIND sellers for agents. Details for stamp. Russell Johnson, Clarkfield, Minn.

25,000 SPECIALTY Agents (or Mail Order Men). Information 26c. F. G. Brizgen, 47 Roslyn St., Rochester, N. Y.

FOUNTAIN Pen. Guaranteed, \$1.00. Free with 30-10c bottles. Send \$3. Springfield Perfume Co., Springfield, Mass.

\$1.25 SAMPLE Free to hunters. Details 10c. Mellberg, 340 Newton North, Minneapolis.

IF We Give You shoes made-to-your measure in any one 60 leathers, 50 different styles, will you keep them, wear them, show them to your friends as sample of our \$10 Made-To-Order shoes to sell at \$6.85? Advise us today. Your complete outfit will go forward absolutely free at once. Dept. 2000, Tailor-Made Shoe System, 43 S. Wells, Chicago.

EASY Money and Quick Sales applying Gold Initials to automobiles. Many buyers waiting. \$1.35 profit on \$1.50 sale. Particulars and samples free. Write quick. Evans Products Company, 32 Gilman St., Hartford, Conn.

BE independent. Make—Sell your own specialties. Immense profits. Catalog dependable Formulas, special selected. Agent's best sellers Free. M. Lustru, 832 East Pershing, Chicago.

AGENTS—\$75 to \$150 Weekly to Introduce "Chieftain." 3 for \$4.95. Guaranteed Tailored Shirts. Samples and full working outfit free. Your Pay Daily. Cincinnati Shirt Company, Secy. 1581, Cincinnati, Ohio.

AGENTS Wanted—Something new—Fyr-Fyter sells easily. Makes a spectacular demonstration; car owners, homes, factories, stores, practically buy on sight. Our men make \$10 to \$30 a day. Exclusive territory to producers. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fyr-Fyter Co., 995 Fyr-Fyter Bldg., Dayton, Ohio.

AGENTS—30% commission. Full line glove silk lingerie and guaranteed hosiery, mill to wearer lowest prices. Get particulars. Wright Hosiery Mills, Philadelphia, Pa.

AGENTS—Shine-Brite Polishing Cloth polishes all metals. Sample free. Knoll Products, Box 532, Kankakee, Ill.

GOLD-LEAP Sign Letters; make and sell; 1,000% profits. Particulars, Johnston Co., Quincy, Ill.

2,000 YEAR calendar, large profits; sample and particulars 25c. Nassau Specialty Co., Hempstead, N. Y.

AGENTS—Men and Women—send for particulars. J. W. Danielecki, P. O. Box 2163, Manila, P. I.

BE your own boss. Men and women make big Christmas money selling our men's neckwear; sell on sight; big profits. Tyrite Neckties, 515 Ridge Bldg., Kansas City, Mo.

AGENTS make 500% profit handling auto monograms, sign letters, Novelty signs, etc. Catalog free. Hinton Co., 122 E. 58th St., Chicago, Ill.

SIGN letters for sign men; never tarnish. Samples free. Monroe Sign Corporation, New Haven, Conn.

AGENTS—Sell Handyholder. Other Useful Household Articles. Handyholder Company, 505, Baltimore, Md.

SELL Fine Made-To-Order All Wool Suits at \$31.50. Regular \$55 Values. Over 100 6x9 Cloth Samples. All One Price. Furnished. Hustlers Earn \$100 Weekly. Write W. Z. Gibson, Inc., 161 W. Harrison St., Dept. N-517, Chicago, Ill.

SELL by Mail! Big Profits! Books, Formulas, Novelties, Bargains. Particulars Free! Effect, 523 South Dearborn Street, Chicago.

AGENTS—\$100 week; no experience; genuine gold leaf sign letters and script. Consolidated Co., 626 S. Dearborn, Chicago.

BRAND New Household Specialty. Enormous demand, big profits; sure repeater. F. Jordan, Box 614, Seguin, Texas.

PORTRAITS, photo pillow tops, frames, sheet pictures, medallions, merchant's signs, food products, photo jewelry, guaranteed hose, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30 days' credit. Jax. C. Bailey Co., Sta. C, Chicago.

MAKE \$75-\$100 Weekly, Famous Sun-lite household products; Big Quantity Seller; You risk nothing. Your money back for every unsold item. Amazing offer free. Summit Specialty, Union City, N. J.

AGENTS—Sell 40 packages Chewing Gum 5 cents package. You Keep \$1.00. Send us \$2.00. Acheson, 2323 West Cary, Richmond, Va.

\$400 TO \$500 a month easily earned selling New Guaranteed Auto Discovery. Nothing else like it. Big demand; sure repeater. Free folder explains; get it today. Boone Specialty Co., Dept. 327a, Boone, Iowa.

COLLECTS Money from the Dead-Beats. Retails \$5.00—Cost \$1.00—Profit \$4.00. "New Method." Every Storekeeper, Doctor buys quickly. Wonderful Money Getter, Federal Association, Hartford, Conn.

AGENTS—90c an hour to advertise and distribute samples to consumer. Write quick for territory and particulars. American Products Co., American Bldg., Cincinnati, Ohio.

WANTED More Agents—To sell Apex Powdered Soap and also Apex Bleacher. Exclusive territories given to proper parties. Our goods sold on a money-back guarantee. Over 75,000 satisfied users boost Apex products. Write for details to Apex Distributing Corp., 545-47 3rd Ave., Pittsburgh, Pa.

REPLATE brass worn-off Automobile parts. Reflectors, Bath Room Fixtures, Worn spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. \$1.00 half pint Postpaid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

BRING Home the Bacon—selling Stuart's Stain Remover. Removes ink, iron rust, grass and fruit stains. Write for free samples and terms today. C. H. Stuart & Co., 5867 Main, Newark, N. Y.

\$20 DAILY selling Ver-I-Ezy Shoes direct to men or boys in your county. Quick sellers. Low priced. Just take orders; we mail shoes direct. Big cash profit and repeats. Territory protected. Best season now. Write quick, Dept. 229, Easy-Wear Shoe Co., Indianapolis, Ind.

WHY work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Catalog free. Nat'l Scientific Lab., 1904W Broad, Richmond, Va.

66 MILES on 1 Gallon. Scientific Gas Saver. All autos. One free to introduce. Critchlow, L-124, Wheaton, Ill.

SELL Radio tubes direct to owners of radio sets. Big profits. Full information on request. Acme Products Co., 901 Broad, Newark, N. J.

AGENT makes \$57 a day driving nails in fire! Amazing discovery heals all punctures—one tire was punctured 57 times without a leak. Send for free Sample Offer. O. S. Nelson, A-3025, Logan Bldg., Mitchell, S. Dak.

RADIO Gas Lighters are biggest 25c sellers in country. Every gas user buys one or more instantly; 300% profit. Enclose \$1.00 sample dozen or \$10 gross. Including selling plans. M. Masterlite Co., 110 East 23rd St., New York. (Manufacturers famous Masterlite Pocket Cigar Lighter.)

AGENTS wanted to sell to Retail Stores our fancy signs; three colors, shaded with airbrush, great variety. C. Pohlmann, 929 Second Avenue, New York.

AGENTS: No competition selling specialties, guaranteed to satisfy, only \$3.98. Pay daily. We deliver, collect. Nearly everybody buys. \$10.00—\$25.00 daily easy. True-Fit Optical Co., CW103, 1528 W. Adams St., Chicago.

WHY Buy Other's Goods? Start your own profitable business, making them. Free valuable literature tells how, including Chemist's Interesting Lists Guaranteed Reliable Formulas for Latest Specialties; Miller, Chemist, 1706-K Jetton, Tampa, Fla.

DON'T Buy so-called "Master-Formulas" (old recipe-book-stock-formulas). Get this Free, Interesting, Valuable literature describing Latest, Guaranteed, Special Manufacturer's Formulas for all lines latest specialties. Miller, Chemist, 1706 Jetton-G, Tampa, Fla.

AGENTS: \$11.30 Daily in advance! Send for sworn proof! Introducing New Insured Hosiery. 57 styles, 40 colors, guaranteed seven months. No capital or experience required. You simply take orders. We deliver and collect (or you can deliver, suit yourself). Credit given. Pay you daily, monthly bonus besides. 1926 line now ready. We furnish samples. Spare time will do. M. H. Mathews, Card 5861, Cincinnati, Ohio.

IF you want good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. M. L. Rond, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

USE No Liquid, Paste, Powder. New. Prepared Cloth Cleans all metals—Just 11) Rub. Retails 25c, cost 10c (Dozen in Display Carton). "Sample Free." NuLife Metal, Hartford, Conn.

VEST Pocket Radio. Not a toy. Amazing Xmas seller. Retails \$1.50. Your price \$8.50 dozen. Sample \$1.00. 30-mile tuning. Satisfaction guaranteed. A-Tri-umple Products, 506 W. 43rd St., Chicago.

PORTRAIT Agents: Send for prices. Pictures where improvement is necessary a Specialty. Wickersham, 1013 N. Mayfield Ave., Chicago.

ATTABOY—Pung Chow and Joker, Greatest Amusement games ever played on Billiard or Pool Table. Brooks Mfg. Co., 1185 44th Street, Brooklyn, N. Y.

MAKE Real Money Easy selling Typewriters at less than half price. Confidential terms free. Typewriter Sales Co., Ada, Okla.

SUCCEED With Your Own Products—Make them yourself. Formulas, Processes, Trade-Secrets. Modern master methods. Catalog free. H. Thaxly Co., Washington, D. C.

AGENTS for Dud's Gas; cleans stone, brick, tile buildings; wire, prism, frosted, leaded glass; fortunes being made. S. Hampton, 2395 Grand Ave., New York.

AGENTS—Just out, 10 new household specialties; tremendous sellers; 100%—200% profit; \$50 weekly easy. Send for particulars. Housaker, Mazontown, Pa.

AGENTS, Mail Order Men, Beginners. Write today. Wonderful New Plan. Get Money Easily. Quickly. Steadily. Particulars. Sample Free. Sterling, P. O. Box 539, Kansas City, Mo.

ARTICLE costs 5c, sells quickly for dollar. Particulars free. Baggs, 3239 Archer Ave., Chicago, Ill.

AGENTS—Make a dollar an hour. Sell new kind of sharpeners. Sharpens all knives and tools quickly. Demonstrating sample free. Premier Mfg. Company, Dept. 62, Detroit, Mich.

\$50,000. PICTURE Man Friedman made canvassing. Beginners can make \$100.00 weekly with my sales talk. Experienced men make more. Free book "Profits in Portraits" explains. Samples Free. Picture Man Friedman, Dept. 8-C, 541 W. Lake, Chicago.

AWAY Ahead of Every Thing Else! That's "Zippe" as a seller. Show your sample, talk a minute and pocket your profit. A real Sure-Fire, He-Man Money-Getter that repeats—and say, Boy, it actually sells on a ten second Show-Down. If we didn't know we had a proposition that any man could sell eight out of every ten calls, you can bet your sweet life we wouldn't spend money telling you about it! Karam-Smith, 601 F Street, Ft. Wayne, Ind.

AGENTS—\$90 a Week—\$2 to \$5 an hour spare time. Make this with the celebrated line of Ho-Ro-Co Soaps, perfumes, toilet articles and specialties; over 200 items. Big profit makers. La-Em-Strait Hair Dressing selling like hot cakes. Write for Free Sample Case offer. Ho-Ro-Co Mfg. Co., 781 Ho-Ro-Co Bldg., St. Louis, Mo.

AGENTS, Salesmen—Sell New Thermos-tatic Automatic Carburetor Control Attachment for Fords. Big profit, full or part time. Burns 95% air. Doubles Mileage! Attached in 2 minutes. No drilling. Does automatically exactly what Ford manual says do by hand. Cadillac now using Thermos-tatic Carburetor Control under Blawie license. Write today. A. C. Blawie & Co., Dept. 805AX, 662 Lake St., Chicago.

AGENTS: New Selling Plan! \$1.25 premium free to every customer on a \$2.00 sale, consisting of 8-oz. Vanilla 4-oz. Shampoo 4-oz. Lemon Lotion. A big hit everywhere. Complete details free. Territory going fast. Write today. The C. I. Toogstad Company, Dept. 18A, 29 South Clinton St., Chicago, Ill.

\$8.50 TO \$20.00 daily easy. Introducing New Insured Hosiery for men, women, children. 57 styles, 40 colors. Must wear or replaced free. Repeat orders sure. Ny-lund made \$395 one month. Edwards, \$460.60. Mrs. Boe, \$445.25. Why not you? Even spare time work should pay you \$3 per hour. Your Pay Daily in Advance. We deliver and collect. You spend all your time writing orders. No experience or capital needed. We furnish samples. All grades, colors including silks. No matter what you are now selling, it will pay you to get our offer. Maccohee Textile Company, Card 2561, Cincinnati, Ohio.

DISTRICT Salesman: Must be reliable. Prefer married man, 30 years old or over and permanent resident in his community. Exceptional opportunity for good man. Address Sales Manager, Dept. 101, 844 West Adams Street, Chicago.

ANY man handy with paint brush can start furniture refinishing, job painting, handyman shop on nearly nothing; mostly all profit; experience not needed; winning plan brings customers quickly. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

NEW Specialty costs 16c. Sells for 50c. Real \$1.00 value. Astonishing profits daily with our 40 Big Profit Sellers. Write quick for new selling plan and Free Agent's Outfit. General Products Co., Dept. 7N, Newark, N. J.

OVER 100% Profit, Self-Lighting Gas and Cigar Lighters. Everybody interested; repeat business. Sell individuals, dealers, subagents. Particulars Free. P. Bernhardt, 148 Chambers St., New York.

\$110 WEEKLY selling finest guaranteed union made to measure men's suits only \$12.50; boys' two-pants suits \$10.95. Six Latest Patterns that sell on sight. Also all-wool overcoats, vests, caps, riding breeches. Big commissions advanced. Free attractive outfit. Double Service Manufacturers, 1327-35 AF, Washington, Chicago.

AGENTS, everywhere, take orders for leather vests, sheep-lined Coats, Raincoats, Lumber Jackets, Sweaters, Shirts, Men's Underwear, Pants. Big Commissions daily; particulars free. Northern Sales Co., Dept. 221, Northern Office Bldg., Chicago.

WE pay \$48 a week, furnish auto and expenses to introduce our Soap and Washing Powder. Buss-Beach Company, Dept. A42, Chippewa Falls, Wis.

AGENTS—100% Obesity Soap guaranteed to reduce fat people. Twenty other brands honestly medicated Soaps. Easy Sellers. Columbia Laboratories, 18 Columbia Heights, Brooklyn, N. Y.

AGENTS: Full or spare time—to sell hand painted scarfs, dollies, pillows. Extremely low priced. A wonderful new process. Our agents are cleaning up. Paintographs practically sell themselves. Write for full particulars of liberal agency offer and circulars describing Paintographs today. Bradford's Paintographs, Inc., St. Joseph, Mich.

300% PROFIT: Sells Like Wildfire. "Solidified Coconut Oil Shampoo." Gross weighs 10 pounds. All shipments prepaid. Distributing Samples Free. Write Quick. Besterer Products Co., 1941-KS Irving Park, Chicago.

TURN your spare time into dollars selling Polmet Polishing Cloth that cleans all metals without liquid, paste or powder. Retails 25c. Our agents say it sells like "hot-cakes." Prove it yourself with free sample sent on request. F. C. Gule Co., 122 Edinboro St., Boston.

HERE'S your chance! Make \$30 to \$100 weekly in our business—honest, clean easy profit. We furnish everything but the elbowgrease and grit. Quarter brings details. Cooperative, 1659 North Ave., Chicago.

SELL Blue Seal Duplicators. Easy, profitable. Copies typewriting, handwriting, drawings, music; five colors. Hemit \$3.35 for better size sample (retails \$4.50). Argus Manufacturing Co., 63 Park Place, New York.

GET into women's shoe game. No investment. Main or side line. Big money. Style-Arch Shoe Co., Dept. B4, Cincinnati, Ohio.

GENERAL Distributors, Agents, Salesmen—Send for our live wire proposition and sample. Exclusive territory to workers. See our display ad on page 170. Wallace Rim Tool Mfg. Co.

LIVE wires, are you looking for big money? Steam-No-More for Rain, Sleet, Steam, etc., on Automobiles, Windows; repeater; send 10c for 25c tube. Grayco, Box 525E, Port Huron, Mich.

MANUFACTURER'S Agents and Salesmen to sell Spray Finishing Equipments to Factories — Public Institutions — Garages — Paint Contractors. Factory established 20 years. Four Factory Branches—National Distribution. Big Financial Rating. Ask any Banker. Paasche Air Brush Co., 1900 Diversey Blvd., Chicago, Ill.

GREATEST Direct Selling Jingle—Hosiery Plan ever offered agents. Possibilities \$100 up weekly. Placing 100 Men—Women Now. Write Vanizette, 202H Dartmouth, Boston.

GREATEST Sensation of the specialty world. Over 1,000 genuine embossed Display Signs for retail merchants. Write for information. Artistic Signs, 709-E Broadway, New York.

FREE! 25c Chemical Windshield Rain Cloths. Box 265, Station C, Los Angeles, Calif.

RING TUTS Altra. Electrical Mystery 10c. Box 265, Station C, Los Angeles, Calif.

FREE! Metal Polishing Dryless Cloths. Lowest prices. Sample. No pastes, powders, liquids. Box 265, Station C, Los Angeles, Calif.

SALESMEN and Distributors: Supply Hardware, Clothing, Department Stores, etc. New Patented device needed by all men. Quick repeater. Dignified business. Nelson Manufacturing Company, 35 New Montgomery Street, San Francisco.

MANUFACTURE lamb wool polishers, dusters. Newhall, 65 Court, Brooklyn, N. Y.

NEW Patent Fibre Broom Sweeps. Scrubs, Dusts, Mops. 100% Profit. Free Sample. National Fibre Broom Co., St. Louis, Mo.

IMMEDIATE Profits in advance selling Vitalized Bent Pads, made in the Land of Sunshine. Replace hot water bottles and electric pads. Sell on sight. Write for proposition. Dept. PM, Radiant Mfg. Co., San Antonio, Texas.

BUILD your own Business! Free Valuable Literature explains how you can easily make your own Goods—have others selling them. Miller, Chemist, 1706-A Jetton, Tampa, Fla.

YOU Get Our Knitter Free. Help—Sell 16 doz. Men's All-Wool Socks to friends and stores. Wholesale \$9 doz. or send 75c for salesman's sample. Try-On Knitter, Dept. 823, Lowell, Mass.

WONDERFUL Invention. Eliminates phonograph needles. Preserves records. Abolishes scratching. 14,000,000 prospects. \$20 daily. Supply in pocket. Sample on approval if requested. Everplay, Desk B-1, McClurg Bldg., Chicago.

AGENTS, Salesmen—Make real money selling the newest accessory for automobiles. Provides safety in night driving. Three dollars in every sale. Exclusive distribution in your territory. Write quick. Tiffany Mfg. Co., Newark, N. J.

SELL Lawlite Deflector Shields to motorists, garages, etc. Makes any headlight legal. 100% profit collected as sold. Get details immediately. Lawlite Company, Dept. B, 386 Greenwich Street, New York City.

WHY work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Catalog free. Nat'l Scientific Lab., 1904W Broad, Richmond, Va.

MAKES Autos Run like on cool, moist night. Wonderful Vapor Humidifier. One free to introduce. Critchlow, M-124, Wheaton, Ill.

AGENTS—\$240 a month. Take orders for well known line of household specialties, food flavors, toilet preparations, etc. Full or spare time. Build a big permanent business. Must satisfy or money back. Write for free sample Outfit and offer. C. H. Stuart & Co., 5567 Main, Newark, N. Y.

BUILD splendid business making chipboard glass number and name plates, signs, check-boards. Write for particulars. Simpler Utility Co., 1123 Broadway, New York.

LEARN while earning \$10,000 with fast-selling auto devices on market. Be financially independent. Mashken, Indiana Harbor, Ind.

MARVELOUS New Invention. 400% Profit. Liquid Quick Mound for hosiery and fabrics. Tremendous demand. Over hundred other fast-sellers. Local and General Agents. J. E. Johnson Co., Dept. 437, 69 E. South Water St., Chicago.

GET posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 72.

SALESMEN: Write your name and address on a card and mail to us. We'll show you sure earnings of \$20.00 a day. Will you risk one minute and a one-cent stamp against \$20.00? Mind you, we say we'll show you. Address Sales Manager, Dept. 782, 850 West Adams St., Chicago.

EVERYBODY buys from Gibraltar representatives all over country taking orders for famous Gibraltar line consisting of shirts, overcoats, raincoats, pants, hosiery, neckwear and other articles. Outfit re-sending full line Free. Gibraltar Fashion Shop, 724 Roosevelt, Chicago.

DIRECT factory representative to sell changeable letter signs to merchants. Excellent opportunity. Good income assured right men. Address, Maze Manufacturing Co., Norwood Station, Chicago.

SELL high grade Auto Tire Accessories to car owner or dealer. Write for information. Midland Rubber Products Co., 1355 S. Morgan St., Chicago, Ill.

STREETMEN, Big Money. Selling In-stentifiers. Reliable Mfg. Co., Utica, N. Y.

AGENTS—Mesco Corn and Callous Remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Mesco Co., 265 Searle Bldg., Rochester, N. Y.

MAIL-ORDER Houses and Distributors: We pack French made beauty creams, face powders, perfumes, toilet preparations with your label. Chemist, A2700 Wabash Ave., Chicago.

MR. BRUSH Salesman—Old established New York Brush Manufacturers require the services of men in all territories to sell their extensive line of Sanitary Twisted Wire Brushes. We pay larger commission than any other Brush House in the country. Write immediately for our proposition. Wire Grip Sanitary Brush Corporation, 15 Mercer St., New York.

65c PROFIT every dollar! Minute demonstration makes sale. Homes, stores, offices, factories, etc. Big repeater. Free sample offer. Mallard Chem. Co. (A) St. Louis, Mo.

AGENTS—Best seller: Jem Rubber Repair for tires and tubes; supersedes vulcanizations at a saving of over 800 per cent; put it on cold. It vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube; sells to every auto owner and accessory dealer. For particulars how to make big money and free sample, address Amazon Rubber Co., Philadelphia, Pa., Dept. 505.

YOU Can Earn \$1,000 a month or more with an Everett Agency. Write for Brod. Everett Company, Sec. Mich.

SELL something everybody needs. Four out of five buy. \$3.00 profit on \$4.00 sale. Send for outfit. B. Burns, President, 500 Prudential Bldg., Buffalo, N. Y.

FAST Money-Maker. Greatest Polishing Cloth on Market. Big Profits. Sample Free. Wonderful Repeater. Keystone Specialty Company, Dept. B, Altoona, Pa. Established 1906.

MIRRORS Re-Silvered at Home. Costs Less 5 cents per square foot; you charge 75 cents. Immense profits, plating auto-parts, reflectors, tableware, stores. Refinishing metalware, etc. Outfits furnished. Write for information. Sprinkle, Plater 128, Marion, Ind.

AGENTS—Here's a New One. "Best-ever Powdered Hand Soap." Sells like wildfire. Marvelous Discovery. Removes grease, paint, ink, oil, in fact anything from the hands. Cannot harm skin. 150% Profit. Great Repeater. Agents simply earning money. "Free Samples Get the Business." Write immediately. Bestever Products Co., 1945 E. Irving Park, Chicago.

ONLY one sale a day means \$200 per month! Marvelous new adding machine. Retail \$15.00. Work equals \$350 machine. Adds, subtracts, multiplies, divides, automatically. Computes feet and inches. Speedy, accurate, durable, handsome. Five-year guarantee. Offices, Stores, factories, garages, lumbermen buy one to dozen. A fortune for live agents. Write quick for protected territory and free trial. Lightning Calculator Co., Dept. F, Grand Rapids, Mich.

SELL widely advertised Skat paste soaps, toilet soaps, cleansers, polishes, etc. New allowance and commission plan insures success. Skat Company, Hartford, Conn.

WHY work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Catalog free. Nat'l Scientific Lab., 1904W Broad, Richmond, Va.

\$25.00 REWARD for any Corn Great Christopher Positive Corn Cure cannot remove. Good for Warts, Bunions, Moles, Callouses. Price 35c. Self Reliable Hair Food for Dandruff, Itching Scalp, Falling Hair and Premature Grayness. Absolutely guaranteed to grow hair. Price \$1.00. Agents wanted. Reliable Specialty Corporation, Buffalo, N. Y.

AGENTS make big money selling our household goods. Webster Co., 522 Wrightwood, Chicago, Ill.

\$100 A WEEK: Agents, Crew Managers, sell Extracts, Toilet Articles, other necessities. Guaranteed line. Particulars free. Midwest Drug Co., 191 E. Naghten St., Columbus, Ohio.

\$85 WEEK easily made selling men's women's shoes to wearers. Samples furnished. Territory protected. Write now. Paramount Shoe Co., 627 Elmrod Ave., Youngstown, Ohio.

WINDOW Sign Letters. One Thousand for \$9.75 Beautiful design. Perfect cut. Free samples, catalogue, Foil Sign Works, 832 W. 11th Street, Oakland, Calif.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom People, 147 New Jersey Ave., Brooklyn, N. Y.

PROFITS in selling Popular Mechanics Books. Make 100%. Buy books at 50 cents; sell them for twice as much. List of books with descriptions sent free upon request. Write for particulars. Popular Mechanics Press, 200 E. Ontario St., Room 501, Chicago, Ill.

I'VE sold shirts on the coast for over 5 years—must confess that your proposition cannot be equaled anywhere. Others have made similar statements. If you want the best shirt offer ever made write for more details to Supreme Shirt Co., 276-m Fifth Avenue, New York.

AGENTS, men and women. Sell necessities. Every woman a user. Wonderful opportunity to make real money. Colonial Chemical Co., 711 Penn Avenue, Pittsburgh, Pa.

AGENTS—Write for Free Samples. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Co., 605 Broadway, New York.

SOMETHING new—Presto Rubber Repair for tires, tubes; all rubber goods put on cold, no heat, acid or tools; vulcanizes itself in few minutes. Sells to auto owners and dealers, sample free. Pioneer Products Co., Dept. A, Boebling, N. J.

BIG Money Selling New Household Cleaning Set. Washes and dries windows. Sweeps, scrubs, mops. All complete—only \$2.95. Over half profit. Write Harner Brush Works, 132 3rd St., Fairfield, Iowa.

AGENTS—Stamping names on Pocket Key Protectors; sample check with your name and address. 25c. Stamping: Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Degraw St., Brooklyn, N. Y.

ORIENTAL Perfumes bring 100% net profit. Good sellers and better repeaters. Roquia Parfumerie, Inc., Woodlawn 10, Chicago.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbrink Co., 1115 Second Ave., New York.

NEW Marvelous Self-Lighting Pocket Cigar and Gas Lighters. No Friction. Sells on demonstration. Sample 25 cents. Rapid Mfg. Co., 799 Broadway, New York.

EVERYBODY Buys Davis' Nifty Toilet Goods (Assortments). Useful, handsome gifts free to our customers. Over 250 high-quality products. All repeaters. 100% profit. 25 years of success. Write! Davis Products Co., Dept. 56, Chicago.

AGENTS—\$60 to \$200 weekly putting up our Burnished Genuine Gold window letters; scripts. Experience unnecessary. Free samples. Premier Letter Co., 121 N. Francisco, Chicago.

WONDERFUL! Startling! Amazing! Our Ex-Cel Luminous Crucifix and Marical (Luminous) Necklace shine brilliantly in the dark. Sell on first demonstration. Big profits to you. Write for further particulars, or better still, send for sample and territory protection immediately. Crucifix—\$1.50, Necklace—\$1.00, postpaid. W. G. Hannan Co., Dept. B, 2589 So. State St., Chicago.

AUTO owner tire agent wanted each locality to use and take orders for hand-made Mellinger fabric and cord tires; guarantee bond 8,000 and 12,000 miles (no seconds); shipped prepaid on approval; get your tires free; no capital or experience required; make \$100 to \$300 weekly. Write for wholesale prices and sample kit. Address, Mellinger Tire Co., Dept. 300, Kansas City, Mo. or Dept. 300, Philadelphia, Pa.

LIVE Agents Make \$10 Day selling Eureka Strainer and Splash Preventer for every water faucet. Takes on sight. Widely advertised and known. Get details today. A. B. Seed Filter & Mfg. Company, 73 Franklin, New York.

SELF-THREADING Needles, Needle Books, Machine needles, and sales in every home. Fine side lines, easily carried, big profits, sample and catalogue free. Prentice Lee, 145 East 23rd St., New York.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds jewelry world and deceives experts! Beautiful Sample case Free! \$100 weekly! Write Quick! Rajah Diamond Co., Dept. F-7, Salisbury, N. C.

YOU can be your own boss with our Key-Check outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Please Die Works, Dept. M, Winchester, N. H.

WILLIAMS' No-Water Hand Soap. In tubes, has taken Auto owners by storm; washes dirtiest hands perfectly clean without water; easy demonstration makes quick sale, 150% profit. Williams Co., Dept. 265, Montclair, N. J.

WHY work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Catalog free. Nat'l Scientific Lab., 1904W Broad, Richmond, Va.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 46, East Orange, N. J.

AGENTS: Big Money Monogramming by Transfer Method. Catalog Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

INSTANT Weld. Repairs largest punctures without cement or heat. Lenn's profit one day, \$50. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T, Minneapolis, Minn.

\$50-\$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-D North Clark, Chicago.

AGENTS—Clever Invention! Inkspoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Practical"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

WASH Clothes the new way. Use the Torrent Automatic Washer. You will be delighted. Special offer to one in each locality. Storm Royalty Co., 3610 Enright Ave., St. Louis, Mo.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 201, St. Louis.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Denna Co., Dept. A, St. Louis, Mo.

AGENTS, both sexes, we manufacture and control new household article. Fast seller. Big profits. Exclusive territory. Write Now. Connolly, 123 Liberty St., New York.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 404, Amsterdam, N. Y.

AGENTS: 500% profit. "Happy Home Maker Shampoo" builds your own big business. Martin of Indiana made \$75.00 in one day. Missouri man made \$750.00 in one month. Exclusive territory. Geo. A. Schmidt & Co., 234 W. North Ave., Chicago.

WE Pay \$50 a Week and expenses and give a Ford Auto to men to introduce poultry and stock compounds. Imperial Co., D. 23, Parsons, Kans.

EASY, pleasant work for Mechanics. Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS \$1. Retail \$3. Your Profit \$2. Wonderful, pocket Adding Machine with Magic Writing Pad. Particulars Free. Typewriter Supply, 905 Hersch Bldg., Pittsburgh, Pa.

EASY Money Applying Gold Initials. Monograms on automobiles. Anyone can do it. Simply transferred from paper; takes 5 minutes. Make \$1.50, cost 5c. Samples free. "Ralco," 1043 Washington, Boston, Mass.

\$31.00 PROFIT—with \$1.50 Outfit—Big Money—Easy Work. Selling Gold Monograms for Automobiles, Luggage, Windows, Wagons. No Experience. No License. "Samples Free." NuLife Monograms, Hartford, Conn.

AGENTS: Handle a new necessity. Paint-nographs sell everywhere. Big Christmas demand. Write for Circular and information today. Bradford Company, St. Joseph, Mich.

AGENTS Wanted in Every County in the U. S. A. for Electric Blankets, Bed Warmers, Caps and Warming Pads, Stretching, Developing and Gymnasium tables. Wallace Electric Appliances, P. O. Box 147, Oakland, Calif.

LARGE Manufacturer Wants agents. Make \$100 weekly. Outfit free. Sell made-to-measure genuine Cravenette Gabardines, \$14.50. Whipcords, \$12.50. Reversible Raincoats, \$9.75. Standard Raincoat Co., 131 W. 17th St., New York.

BUSINESS Guide with Free Legal Service Sells everywhere; Wells cleared \$1,185 in 35 days. Write for free outfit. Nichols Co., Naperville, Ill. Dept. 4B.

EVERYBODY uses Extracts. Sell Duo Double Strength Extracts. Complete line of household necessities. Big repeaters. Write today. Duo Co., Dept. E1, Attica, N. Y.

AGENTS make \$100 week placing advertising Cigar Lighters with glass front. Every dealer wants one. Write for free plan. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MAIL Order Business. Excellent Side Line. No stock to carry. Details Free Hunt Co., Morrisville, Pa.

\$35 A DAY—Easy, selling our fast seller policy, which pays \$20 weekly sick benefit, \$40 weekly Accidental Benefit, \$500 natural death, \$1,000 accidental death, \$2,000 travel accidental death. Lowest premium rates. Biggest commissions. Large renewals. American Peoples Life, 1107, 139 N. State St., Chicago.

FREE Sample—"Rain Shield Wiper" Retail \$1.00—cost 25c. Just invented. No Cloth—No Paste—No Attachment. Sold Clear and Rainy Days—(1) Rub keeps Windshield Clear 24 hours. Automobiles buy quickly. Riley made \$198—three days. Experience Unnecessary. Wonderful Sideline. NuLife Corporation, Hartford, Conn.

CALIFORNIA Rosebuds selling like hot cakes. Agents earning money; new stuff. Big profits. Catalog free. Mission Factory PM, 519 No. Halsted, Chicago, Ill.

MANUFACTURE Chipped Glass Numbers; particulars Free. Beveridge, 160-22 Locust Avenue, Jamaica, N. Y.

DUSTLESS Sponge Cloth. New Invention. (1) Rub—Dusts. Cleans and Polishes Automobiles, Furniture, Pianos. Retail \$50c—Costs (16c). "Sample Free." NuLife Sponge, Hartford, Conn.

BIG Profits with Exclusive Territory—\$50 to \$100 weekly easy. More has often been made in one day's work. A hot or cold running water bath equipment for any home at only \$7.50. No plumbing or water works required. Investigate. Send no money. Write today. Sanitary Supply Co., 753 Allen Building, Toledo, Ohio.

CLEAN Up, now till Christmas. Swell Holiday Line. Wonderful Sellers. Big Margin. Hire Sub-agents. Catalog Free. Mission Factory PM, 519 N. Halsted, Chicago.

WHY work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Catalog free. Nat'l Scientific Lab., 1904W Broad, Richmond, Va.

\$145.00 WEEKLY. Wonderful Vapor Humidifier. All autos. One free to introduce. Critchlow, N-124, Wheaton.

AN Opportunity never before presented. Representatives wanted in every state in the U. S. A. and Canada, on a direct selling plan. No license required, no competition. Article a household necessity, fully guaranteed. Price within reach of all. Exclusive territory assigned. Particulars: Dundee Mfg. Co., Inc., 157 Summer St., Boston, Mass.

\$3.50 AUTOMATIC Adding Machine. Excellent profits here for workers. No experiment, but old, reliable, meritorious proposition. Year after year seller. Write us. Bassett Company, 1458-P Hollywood Ave., Chicago.

AGENTS—N-R-G Laundry Tablets, the old reliable money-maker for live agents. Millions sold—200% profit—sales waiting for you. Clothes washed spotlessly clean in 10 minutes without rubbing. Free samples. N-R-G Company, 230 W. Superior, Chicago.

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

AGENTS: Our gold-eyed Needle Cases are wonderful sellers: immense profits; \$50 to \$300 weekly; proof and particulars free; sample outfit 15c; factory prices. Patsy Needle Co., 231 Davis Square, Somerville, Mass.

MEN or Women Agents, Full or spare time, selling Stationery. Every Man and Woman a customer. Sample outfit Free. Scheffer Stationery Company, 1398 Ewing St., Fort Wayne, Ind.

SELL direct, Shotguns, Rifles, Pistols, Revolvers, from catalog. Stoeger Incorporated, 224 East 42nd Street, New York.

AGENTS—Steady income. Large manufacturer of handkerchiefs and dress goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

\$20 PROFIT daily selling self-threading needles, needlebooks; cost 3-5c each; sell 25c; three samples 25c. Catalog free. Needlebook Specialty Co., 661 Broadway, New York.

AGENTS: \$300—\$500 monthly easy taking orders for Moray Rim Tool. Autolists and trade buy on sight. M. Moray Rim Tool Company, Blissfield, Mich.

BIG Money—fast sales; everyone buys gold initials for their auto; sell \$1.50, profit \$1.44. Ten orders daily easy. Samples, information free. World Monogram, Dept. 16, Newark, N. J.

FREE Booklet describes 52 plans for making \$20.00 to \$100.00 weekly in home or office business of your own. Downs Co., 2323A Myrtle, St. Paul, Minn.

A BUSINESS of your own. Make and sell chipped glass name and house number plates, checkboards, signs. Booklet Free. E. Palmer, Dept. 512, Wooster, Ohio.

EARN \$10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Decle Laboratories, 1133 Broadway, New York.

CARPENTERS. Popular Mechanics Carpenters' Handbook is filled with ideas for those who like to tinker with tools, and for professional carpenters. 40 articles on saws and sawing, 17 on benches and bench equipment, 23 on doors and door hanging, 13 on lumber, 13 on mitering, 74 on tools and their care, 22 on shop equipment, and many others—366 in all, and 229 illustrations. Send No Money. Just write a postal. Pay postman postage and \$1.50. Popular Mechanics Press, Room 301, 200 E. Ontario St., Chicago, Ill.

NOW that you have read all these offers, read Macoshee Company's (Cinti, Ohio) advertisement again.

HIGH GRADE SALESMEN WANTED

WANTED—Tailoring Salesmen, make \$60 to \$125 per week. Biggest merchants in many towns have started with our line. We are the largest made-to-measure tailoring house in the country, furnishing elaborate sample equipments, including 500 all-wool fabrics. You make your own profits from \$8.00 to \$15.00 on each order. Guaranteed absolute satisfaction, perfect fit, best workmanship, or no sale. Write for our line and all accessories to be sent free. Tell us all about yourself. Address N. O. Perry, Sales Manager, Box 493, Chicago, Ill.

BANCROFT-HUNTER Company, Inc., 411 So. Wells St., Chicago, makers of high grade men's all wool clothes selling direct to wearer at \$23.75, are opening sales agencies. Men are wanted who have sold tailoring or something similar. A liberal profit, bonus and co-operative advertising. To qualify must furnish references as to honesty. No investment required—we furnish everything. Write for booklet "Developing a Sales Agency," which tells everything about the proposition. Address above.

TAILORING Salesmen—Many men in your town pay \$15 to \$20 more than our wholesale prices for the same woolsens, workmanship and high-grade, perfect fitting, tailored-to-measure suits and topcoats—all these are live prospects. Complete selling outfit free. 200 choice patterns—all wool; five prices, \$18.50 to \$36.50. Absolute "no-pulling-out" hair cloth fronts. Positive 8-day service. Substantial commissions, bonuses and special prizes. Protected territory. Free advertising. Experience unnecessary. Our sales manual tells you "how." Tell us about yourself, giving two business references for quick action. Wholesale Direct Tailors, Dept. 1203, 83-89 Ellicott St., Buffalo, N. Y.

SALESMEN—Get this big sensational, order-getting shirt outfit free. Sell Style-mor Shirts all year round. It's Chicago's Wonder shirt line. Advanced fall showing of smartest, snappy patterns. Large double swatches, low prices, quick service, makes shirt selling easy. Bellard of Texas made \$40.00 in two days. We deliver and collect. Write today for big free outfit. Stylemor, 81 W. Van Buren, Chicago, Ill. Dept. 1100.

SALESMEN—Make \$6 to \$8 per sale. Double your profits selling the Strand Tailoring Company's two-price all-wool line, \$29.50 and \$34.50 (including your commission) worth \$40 to \$50. Over 100 samples to show. Superb tailoring—perfect fit—guaranteed linings—six day delivery service. Write today for this easy selling double profit line. Strand Tailoring Company, 1323-1341 Dickson St., Dept. 102, Baltimore, Md.

IF You Think in Terms of \$6,000 the First Year write Us Now. Strong line for retail stores. Nationally advertised. Established concern. Best season now starting. Liberal weekly advance to producer. The Continental Co., 1922 Euclid, Cleveland, Ohio, Dept. 200.

SALESMEN—We furnish you a new Ford car immediately and set you up in business. You own both car and business. No capital required. Profits \$50 to \$150 per week easy. Exclusive territory, city or country. Biggest opportunity ever offered hustlers. Territory going fast. Write quick for details. W. & B. Walker, Inc., Dept. 33, Herr's Island, Pittsburgh, Pa.

\$600 PER month and more. Our product sells with a guarantee of sales. We pay 24% commission. Write today. C. V. Champion Co., Danville, Ill.

SALESMEN—Experienced men to sell disinfectants, deodorants, insecticides, sanitary supplies to hospitals, institutions, etc. Commission basis. Ellis Davidson Co., 348 West 52nd, New York.

SALESMEN and Agents: Write for big Money-Making offer selling Suits and Overcoats, Made to Measure; easy sales. Preuss Tailoring Co., 305 5th Ave., New York City.

SALESMEN for new patented padlock; no keys; cannot be picked; excellent future for right man; state experience. Write Defender Lock Co., 68 Cliff Street, New York.

REPRESENTATIVES selling direct to consumers or any ambitious person can obtain information relative to plan which will substantially increase their income. Estru Products Company, 2003 W. Madison, Chicago.

SALESMEN, Salary or commission. Sell cigars direct to consumer at wholesale price. Wonderful opportunity. Send stamped addressed envelope. San Hoy Cigar Company, Tampa, Fla.

SALESMEN—Fast Selling Tampa Cigars! \$40 weekly salary and expenses; experience unnecessary. Send stamped addressed envelope for particulars. Gulf Coast Cigar Co., Tampa, Fla.

SALESMEN sell phenomenal advertising specialty. Metcalfe's commission \$72 one sale. Another man made \$120 in 3 hours. Clamps on auto dash with oil change warning. For sample, write Kloppe Printing Company, Omaha, Nebr.

SELLS for \$9.75. Prints ad on wrapping paper, envelopes, etc. \$4.00 commission. Send 10c for sample work. Automatic Ad-Stamp, Joplin, Mo.

BEST Seller. Jem Rubber Repair for tires and tubes; supercedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, guaranteed to last life of tire or tube; sells to every auto owner and accessory dealer. Get particulars how to make big money and free sample. Amazon Rubber Co., Philadelphia, Pa. Dept. 510.

\$18.00 DAILY representing established manufacturer taking orders Ladies' House Frocks, Knitted wear, Lingerie, direct to wearer. Outfit free. Counsel Corp., 206 No. Wells, Chicago, Dept. L11.

MEN Wanted—to sell dependable fruit trees, shrubbery, etc. Steady demand. Complete cooperation. Pay check weekly. Write Perry Nurseries, Dept. B, Rochester, N. Y.

BRANCH Manager for National Real Estate organization Profit-sharing basis. Capable salesman can earn \$10,000 annually. VLCCo., 257 Union Trust Bldg., Pittsburgh, Pa.

SALESMEN and Agents (open—women) for the Adding Pencil. It adds, multiplies, counts, checks. Size of fountain pen. Very attractive. Everybody wants one. Clear \$10 to \$20 daily. Write, Adding Pencil Co., Dept. 44, St. Louis, Mo.

NEWEST Invention! Sells every office, home, store. Automatically coils telephone and iron cords. Abolishes snarls and kinks. Great time and temper saver. \$25 daily. Samples for test if desired. Neverknot, Dept. 1-1, McClurg Bldg., Chicago.

HERE'S a big money maker: Masterlite Pocket Cigar Lighter; something new in specialty field; sells instantly upon demonstration to consumers and dealers. Send 50c stamps for sample and selling plans. M. Masterlite Mfg. Co., 110 East 23rd St., New York. (Manufacturers well-known Radio Gas Lighter.)

WHY work for others? Make and sell your own goods. Formulas, toilet articles, perfumes, extracts. Catalog free. Nat'l Scientific Labs., 1904W Broad, Richmond, Va.

GO into business without investing a penny. No rent to pay. No stock to carry. Yet you make bigger profits than regular storekeepers. Write for facts at once. Address Sales Manager, Dept. 701, 350W. Adams St., Chicago.

DISTRICT Salesman: Must be reliable. Prefer married man, 30 years old or over and permanent resident in his community. Exceptional opportunity for good man. Address Sales Manager, Dept. 102, 844 West Adams Street, Chicago.

SALESMEN—Earn \$75 to \$250 weekly selling our All Wool made-to-measure suits \$25 retail, \$4 to \$6 profit on every sale. Six day delivery. United States Fidelity and Guaranty Bond of satisfaction or money refunded. Experience unnecessary. Write today for large free spring samples. Homeland Tailoring Co., Inc., 13 to 27 W. Fayette St., Dept. 105, Baltimore, Md.

GOOD salesman can secure exclusive territory for new patented Key Case. A big seller with big profits. Brand new. An opportunity for real producers to make big money. The Minnesota Specialty Co., 78 E. 2nd St., St. Paul.

SALESMEN Can make \$5.00 a day selling our Calendars, Pencils, Signs. Advertising Novelties, Yardsticks, Whistles, etc. Liberal terms. Sells entire year. Fine side line. Local and traveling agents. Model Calendar Co., Dept. 226, South Bend, Ind.

SIDELINE Salesmen—to sell an instant toothache relief remedy. Sold to Druglists, restaurants, poolrooms. About 40% profit. F. J. Leopold, Adrian, Minn.

\$50 DAILY Selling Salesboards—Make up to \$23 on single sale, selling largest, lowest priced line; no samples to carry; write for 2-color catalogue and full particulars. Lincoln Sales Co., Dept. E, 9 So. Clinton, Chicago.

TAKE orders for coffee, sugar, flour, meats, canned goods, staple groceries; also paints, radio sets, tires, auto and tractor oils. No capital or bond required. We deliver and collect. Permanent business. Big pay. Write at once. Hitchcock-Rill Co., Dept. 30, Chicago.

FOUR \$7.50 sales to merchants net you \$20.00 daily. Savers Systems, 2803 Sheffield Ave., Chicago, Ill.

SALESMEN—Become Independent. Own Your business, experience unnecessary selling our \$7,500 Accidental Death; \$50 Accident; \$25 Sick Weekly Benefits—\$12.50 Yearly. Other Amounts proportionate. Guaranteed steady income from renewals, \$250,000 Deposited Insurance Department. Universal Policy, Dept. A, Newark, N. J.

\$10.00 SUITS at \$23.50! Think of being able to offer a \$10.00 suit made of the finest quality of pure Virgin Wool; fit, fabric and fashion guaranteed; at the powerfully attractive price of \$23.50! Can you sell such values? You can if the experience of 2,000 other salesmen means anything. And you don't have to know anything about selling clothing. We'll take you, train and equip you to go out and make a success of this work. If you are honest, ambitious and willing to work. If you are, write us. You'll hear from us promptly with the full facts. Address Dept. 700, William C. Bartlett, Inc., 850 West Adams Street, Chicago.

ADVERTISING Salesmen wanted to take orders for Auto Key Purse; new invention; sells to advertisers by thousands; commission 20%; sample by mail 25c. Novelty Cutlery Company, 322 McGregor Ave., Canton, Ohio.

OUR line entirely different; larger commissions. Quality merchandise. Prices right. Coffman Pencil Company, Cedar Rapids, Iowa.

EASILY make \$50 to \$100 weekly extra during your spare time. Season just opening up. Iowa Novelty Company, Box 1961, Cedar Rapids, Iowa.

AUTOMOTIVE Specialty Salesmen. Steady Profits. Results Guaranteed. Adams-Barr, Columbus, Ohio.

MAKE \$100 Weekly in spare time. Sell what the public wants—long-distance radio receiving sets. Two sales weekly pay \$100 profit. No big investment, no canvassing. Sharpe of Colorado made \$955 in one month. Representatives wanted at once. This plan is sweeping the country—write today before your county is gone. Ozarka, Inc., 126-B Austin Ave., Chicago.

EASY to Sell Groceries, Paints, Lubricating Oils, from samples to consumers in towns and country. Prices meet all competition. No capital or experience necessary. Profitable, steady work. Commission advanced. Satisfaction guaranteed; 53 years in business. Write Loverin & Brown Co., Wholesale Grocers, 1775 So. State, Chicago, Ill.

\$60-\$300 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

TRAVELING Salesmen calling on retail stores wanted by large manufacturer to sell unique line of business-boosting articles. Year round, fast selling, main or side line. If not earning \$150 weekly, address Elsasor Works, 222 Charles St., Broomfield, N. Y.

CALIFORNIA Rosebuds selling like hot cakes. Agents coining money. Absolutely new. Big profits. Catalog free. Mission Factory SP. 519 No. Halsted, Chicago, Ill.

GET into Business for Yourself. Make storekeeper's profits without storekeeper's troubles. We'll show you how. In fact, we'll put you into business, furnish everything you need, train you, carry stock for you without your investing a penny. We'll work with you until we've made you a success. We have done it for others. We'll do it for you—provided you are honest, ambitious and willing to work hard. If you are, write us. You'll hear from us at once with facts. Address Dept. 103, Goodwear Chicago, Inc., 844 West Adams Street, Chicago.

HELP WANTED

MEN, 18 up, wanting U. S. Mail Service jobs, \$142 to \$225 monthly. Steady. Experience or correspondence course unnecessary. Particulars free. Write P. Bradford, 112 N. 50th St., Philadelphia, Pa.

AGENTS—\$91.50 Weekly and up—Your Pay Daily. Introducing New 12 months Insured Home for men, women, children. You write orders. We deliver and collect for goods on credit and you can deliver, suit yourself. No experience or capital needed. Samples furnished. All colors, grades, including silks, lises, wools, heathers. Write Quick. M. H. Mathews, Card 2601, Cincinnati, Ohio.

ARE you old at forty? See our advertisement on page 144 of this issue. The Electro Thermal Company, 2137 Main St., Steubenville, Ohio.

GET posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 72.

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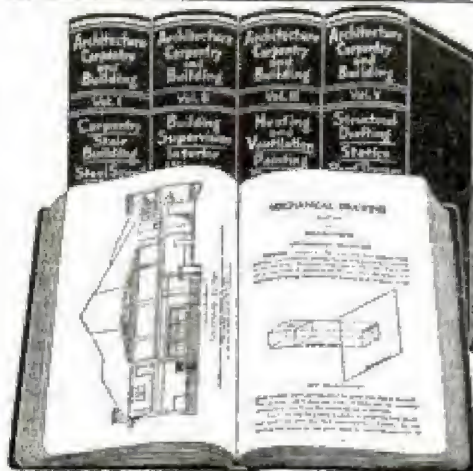
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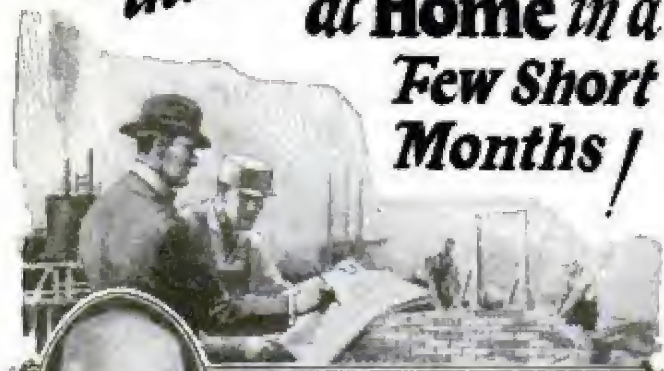
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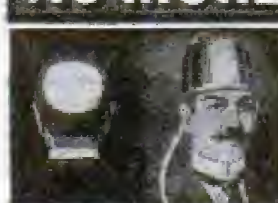
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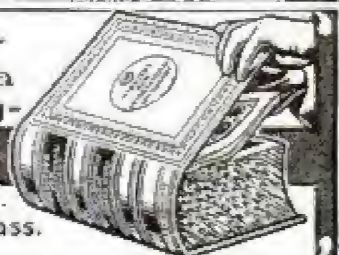


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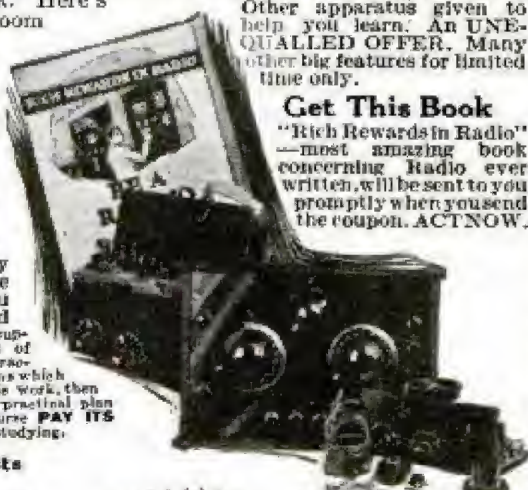
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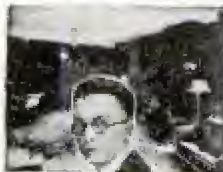
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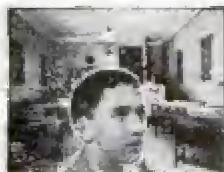
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"Something had to be done. I was terribly discouraged. More pay was one solution. But I knew just how slim my chances for a raise were when only the week before old Barnett had laid off seven or eight of the boys.

"Even that next Monday morning Bill Newton passed a rumor around that the general manager had ordered another cut in the office force.

"All that week I was on 'pins and needles.' I could not do a tap of work. Some of the fellows kidded one another as to what they would do after receiving the bad news. But in my case it was far from being a joke, and when old Barnett finally told me how sorry he was to have to let me go temporarily, the thought brought back with a chill the situation that faced me.

"The three weeks pay I received would help me over the weeks between jobs. But what about a new position? Here I was in a profession that was so overcrowded that you were always treading on one another's toes. I was desperate! I would take anything for the time being.

"But everywhere I went it was the same old story. 'Just fill out this application, and if anything turns up we will be glad to place you.' I knew what that meant.

"Then one morning, the latter part of that week, I was waiting in the outside office of a large manufacturing plant to see the superintendent. There were several applicants ahead of me. I casually picked up a magazine lying on the table and turned a few pages without the slightest bit of interest. Suddenly something caught my eye. Could what I saw be true?

Enormous Demand for Commercial Artists Earn \$100 a Week In This Fascinating Field No Experience Necessary

"I read on. \$100 a week. Why that was more than three times as much as I had ever earned. And the work was easy and you were your own boss.

"The thought came as a flash of lightning. Why not? I had always liked to fool around with a pencil, but had the idea that artists were 'born' and not made.

"Somehow or other I did not believe commercial art could be learned by mail. But there was nothing to risk—and when I thought of my wife, and the operation the doctor had long ago advised, I did not hesitate one moment.

"I ran out to the nearest newsstand and purchased a copy of the magazine and hurried home. One clip of the shears, a few

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* * * * *

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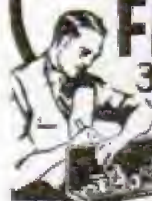
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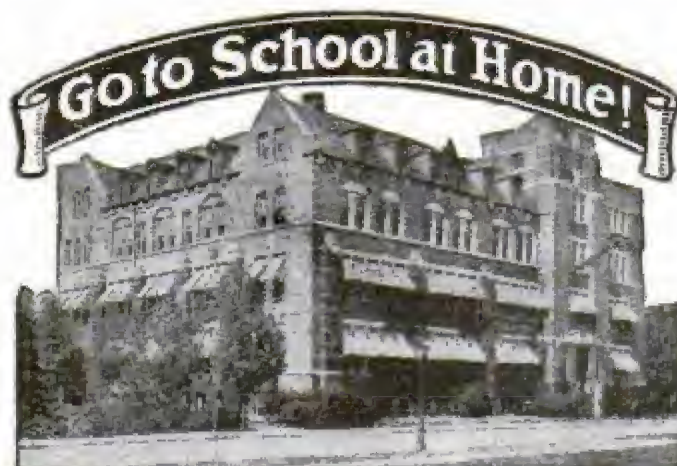
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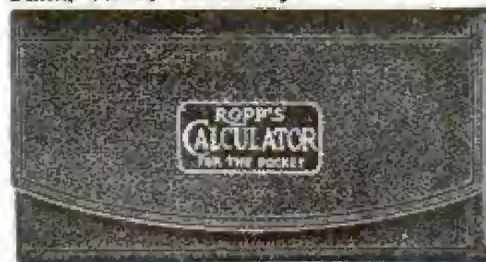
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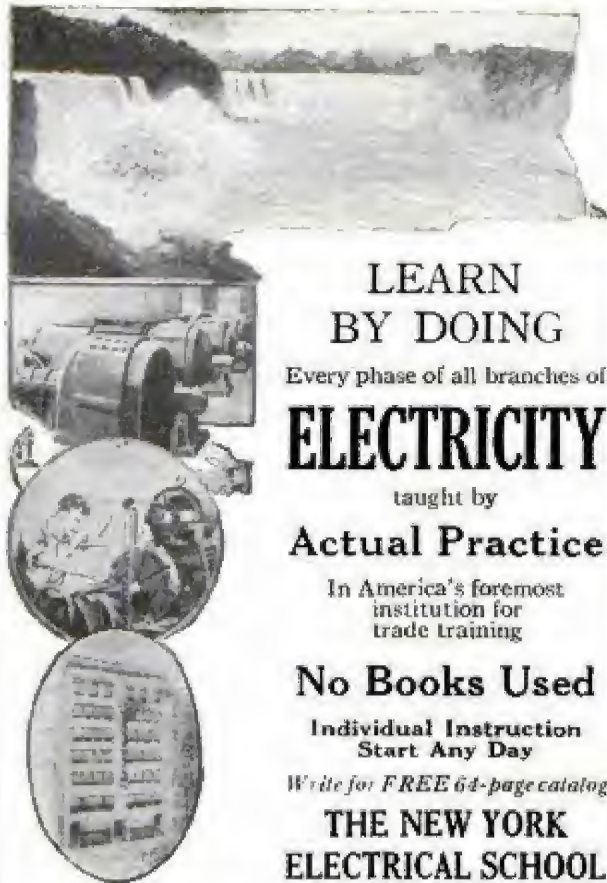
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A few very fortunate persons—like the late Caruso—are born with the ability to sing well. But even Caruso had to develop his Hyo-Glossus muscle before his voice was perfect. You can develop a beautiful singing or speaking voice if your Hyo-Glossus muscle is strengthened by correct training. Professor Feuchtinger, A. M.—famous in the music centers of Europe for his success in training famous Opera Singers—discovered the secret of the Hyo-Glossus muscle. He devoted years of his life to scientific research and finally perfected a system of voice training that will develop your Hyo-Glossus muscle by simple, silent exercises right in your own home. The Perfect Voice Institute guarantees that Professor Feuchtinger's method will improve your voice 100%. You are to be your own judge—if your voice is not improved 100% in your own opinion, we will refund your money.

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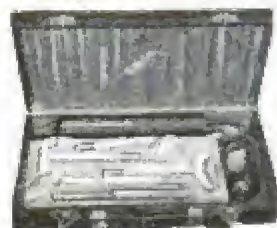
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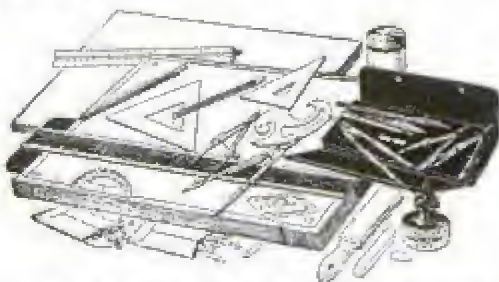
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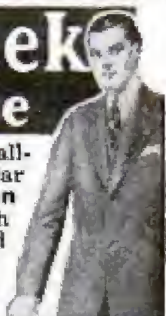
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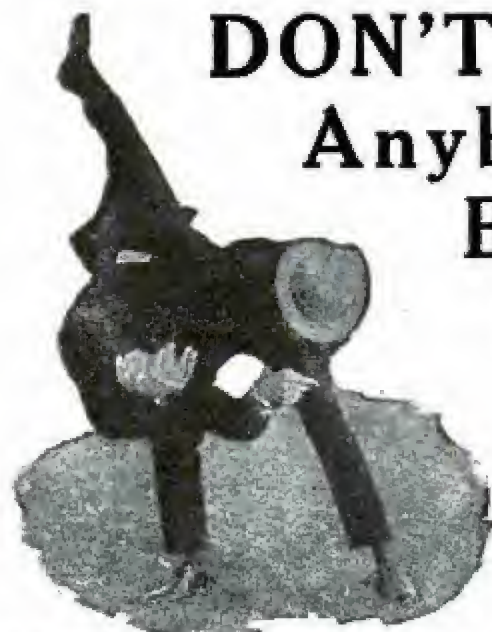
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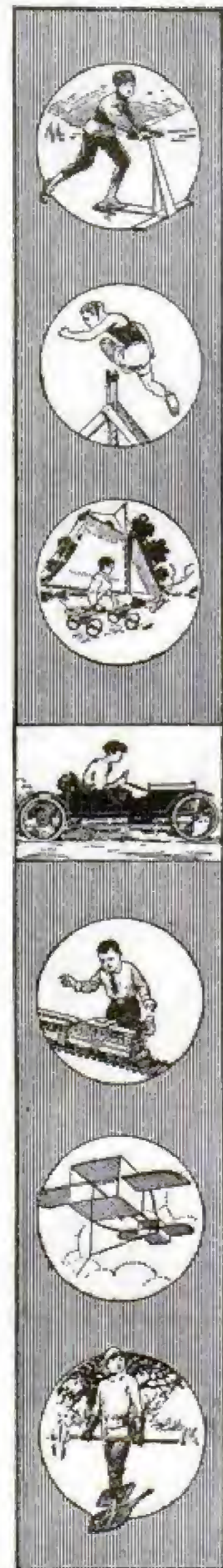
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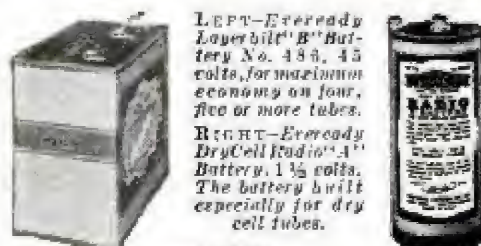
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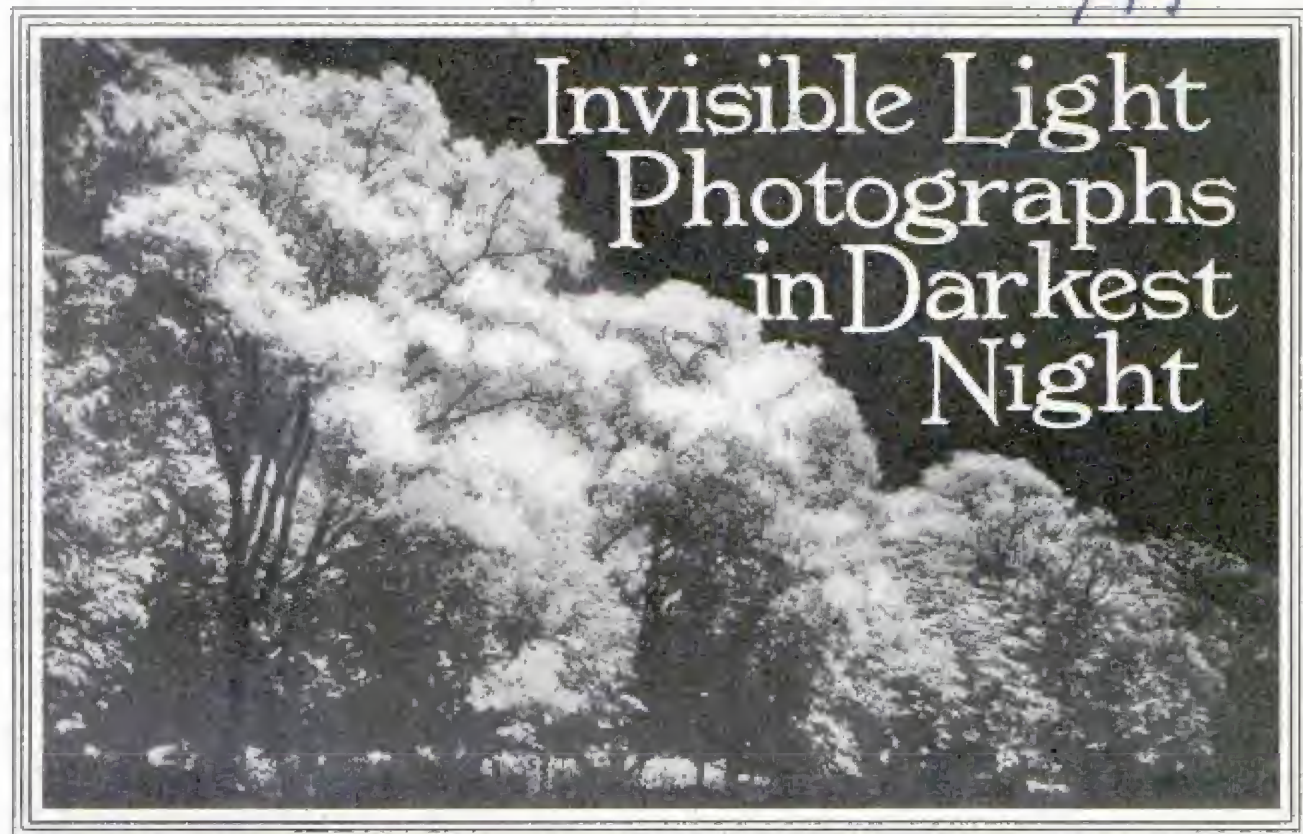
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Vol. 45

JANUARY, 1926

No. 1



Beautiful Snow Effects Are Obtained by Professor Wood in Photographing Green Trees and Grass by Invisible Infra-Red Rays, Which Lie outside the Visible Spectrum

Pictures by Unseen Rays and of Unseen Objects One Hundred and Fifty Miles Away Achieved by Quartz Lamp and Lens

INVESTIGATION of an announcement from Tokyo recently that Jusei Sugiye, a Japanese scientist, had succeeded in taking photographs in the dark by an invisible light revealed one of the war-time secrets of the U. S. navy which helped guide the ship convoys across the ocean at night without visible lights, which would have betrayed them to submarines.

The same invisible light used by the Japanese scientist was employed in war time to enable the ships to keep their places in line and Dr. Harvey Brace Lemon, of the University of Chicago, who recalled the war stunt, has duplicated in his laboratory the Japanese achievement.

The invisible light is obtained by passing the rays through a black glass impervious to all but the ultraviolet portion, which cannot be seen by the eye. Lights, sheltered behind this black glass, on the

stern of each convoy ship were invisible, but the next ship in line could see it by focusing on it a telescope in which was fixed a small fluorescent screen, like the screen used to make X-ray pictures visible.

Ordinary glass will not pass ultraviolet rays—which is the reason sun cures must be taken in the open air, or behind a window of quartz. To take pictures by the invisible light, it is necessary not only to have the special black glass, but the light behind it must be inclosed in a quartz tube in order that the ultraviolet rays may escape.

In the experiments made by Dr. Lemon a small mercury-vapor lamp in a quartz globe was used, the lamp being mounted in a wooden box, with a sheet of the black glass in front. A subject posing before it for a photograph becomes visible because his eyeballs, fingernails and teeth become fluorescent, shining in the

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dark, and in some cases even the skin and hair show similar activity.

The eyes have a peculiar sensation of receiving a bright light, though none is visible, and if the head is lowered to take the eyes out of the ultraviolet beam, the sensation disappears so suddenly that it feels as though a nerve has been severed.

Even the fairest skin, devoid of freckles, photographs covered with dozens of them, for every place where the pigment of the skin has a latent tendency to freckle, if exposed too long to the sun, the concentrated invisible rays pick out the difference and imprint it on the photographic plate.

Camera plates are so sensitive to the rays that they easily become fogged from exposure. In absolute darkness, with the camera at one side and behind the light source to protect the plate, a second's exposure is sufficient for a picture. Pointed at the light source, the black glass becomes transparent to the camera, though not to the human eye, and the plate records a picture of the hidden apparatus within the light box.

Fluorescent liquids glow in the dark as they pick up the invisible rays. Water with a small amount of esculin dissolved in it remains clear and pure to the naked eye, but exposed under the ultraviolet rays, it flares with a brilliant ultramarine, only to turn again to clear water when

taken away. The invisible light can be used not only to take pictures in the dark, but will photograph invisible objects miles away. At Lick observatory, in California, Prof. Wright has succeeded in taking pictures of redwood trees on the Sierra mountainsides 150 miles away, every detail of the trees showing clearly. A quartz lens, heavily coated with silver, to keep out all visible light, was used in a camera made of apparatus used to photograph distant stars. With the same lens, it is possible to send up an airplane and hide it in a cloud, so that it becomes invisible to the people on the ground, and yet take pictures showing every detail of the ground, since the invisible rays pass through the cloud without interruption.

Remarkable rainy-day and fog effects can be produced in out-of-door photography with the ultraviolet rays. Prof. Lemon has been experimenting for several years with them.

Another experimenter, Prof. Wood of Johns Hopkins university, is working at the other end of the spectrum, photographing by the infra-red rays, which are below the band of visible reds. Pictures of green trees and grass taken by this light turn out wonderful snow effects, the greens photographing white.

The study of the invisible rays at either end of the visible spectrum, whose colors unite to form white light, is still in its in-



Eyeballs and Teeth Become Fluorescent under the Ultraviolet Ray, and Invisible Freckles Appear; Picture Taken in the Dark by Invisible Light, at Left, and in Ordinary Light, at Right

fancy, though the last missing band of wavelengths has finally been measured. With new chemical combinations for their plates and better equipment, research workers are constantly extending the field of photography into things the eye cannot otherwise see.

Investigation of invisible light has received considerable impetus within the past few months by the discovery of a process for producing crystal quartz cheaply and in quantities, and by revelation of the healing power the rays possess. Because of the relative cheapness of quartz produced by the new process, entire windows of the material have been made possible, the first being installed at Johns Hopkins. Experimenters in recent months have discovered that the ultraviolet rays will cure such diseases as rickets, common particularly among children in crowded tenement districts where little sunlight penetrates. Experiments on chickens showed that fowls confined in hothouses under ordinary window glass failed to attain their growth, sickened and eventually died of rickets, marked by failure of the bones to develop. Other chickens exposed for only



Mercury Lamp in Quartz Globe and Black Glass, Which Passes Only Ultraviolet Rays, Above; Water with a Small Amount of Esculin, at Bottom, Remains Clear as Crystal, but Becomes Fluorescent under the Rays, Center

a few minutes daily to ultraviolet rays thrived.

In the hands of an inexperienced person the rays, however, are a source of danger. Only a few minutes' exposure is sufficient to produce a bad case of sunburn, while the

eyes may be injured unless protected by goggles. The special black glass used in laboratory experiments is designed to pass rays on the borderland of visibility, to lessen the danger of burns and the bad effect on the eyes.

Beyond possible use in war time, in photographing enemy troop concentrations without their knowledge, no use has yet been found for photography by ultraviolet rays, but the reaction of pigment in the skin to the invisible light may some day make it valuable in the study of skin disease. Even now it is a good test of the origin of one's teeth, since only your own become fluorescent under the rays. Fillings, crowns and false teeth remain dark and loom up as gaps in the finished picture.



PITCH OF FIRE-ALARM SIGNAL TELLS LOCATION OF BLAZE



One of the Triangle Fire-Alarm Signals That Tell Location of Blaze by Their Pitch

Volunteer firemen in a Maryland town determine the approximate location of a blaze by the pitch of the alarm, the clang of a triangle, beaten by an iron rod. There are four such signal instruments, each in a different section of the village, and each varies in pitch by several notes. A little practice and a fairly acute sense of hearing and music, enable the volunteers to rush the hose cart and other apparatus to the scene of the fire with the least possible delay.

FAST MAKES BRAIN MORE ACTIVE

Prolonged fasting retards mental ability and alertness, but the brain's efficiency suddenly increases, often above normal, when eating is resumed, tests conducted at the University of Chicago show. Three subjects were chosen for the experiments. One of them went without eating for thirty-three days, one for seventeen

and the other for ten. Hands were steadier and the brain keener after the fast than before. Seven tests were given, such as reading clippings from a magazine backward; naming 1,200 mixed colors; writing the letters "ab" for twenty minutes; reading various kinds of type in a dark room under a standard light; testing the steadiness of the arms, and standing at attention for a given length of time. The tests were made during the fast, at its conclusion and from twenty-three to thirty-three days thereafter. The subjects kept diaries in which they recorded their sensations and experiences. Most of their dreams were about food.

SHIP CANAL BETWEEN BRIDGES ACROSS ENGLISH CHANNEL

Suggested by a Swiss engineer as a substitute for a tunnel, a bridge over the English channel would be constructed in the form of two parallel jetties with a canal for ships between them. It is estimated that the work would cost \$350,000,000. Spans near each end would be erected to permit the passage of boats, and the breakwaters protecting these points could be used by lighters for loading and discharging cargoes. Each jetty is to provide a double railroad track with a motor highway above.



Drawing of Suggested Jetties over English Channel, Showing Canal for Ships, Spans, and the Protected Areas for Ports



In a Germ-Culture Laboratory: the "Chef" Is Preparing Beef Tea to Feed His Hungry Charges Which Are Being Raised for Experiments and for Helpful Vaccines

Raising Germs to Guard Your Health

Disease-Preventing "Bugs" Are Pampered with Many Luxuries and Have Special Chefs to Cook for Them

GERMS are popularly regarded as harmful, but science rates them so highly that thousands of dollars are spent annually to raise certain varieties for the preparation of vaccines and serums, to save human lives and for experimental purposes. An institute in London keeps about 2,000 kinds on hand for sale. Millions of germs may be purchased for a few cents, depending upon the species. They are shipped to all parts of the world to supply physicians and hospitals.

Some laboratories devoted to germ culture employ special "chefs" to prepare food for the organisms, many of which are so tiny that 500,000 or more may be contained in a single drop. Their diet consists of animal and vegetable gelatin, glucose and beef tea, either with or without sugar. When the germs are properly developed, they are washed off the substance in which they have been raised, thoroughly shaken and counted. This is done with the aid of a microscope by placing them on a ruled glass divided into

small squares. By counting the number of germs in one of the sections and multiplying the result by the number of squares in the total area, the correct number is closely estimated. This is important, for the number of germs determines the strength of the vaccine, which is administered in carefully measured amounts to insure beneficial effect of the treatment.

Before the germs are ready for use, they must be killed. This is accomplished by heating them to about 180 degrees Fahrenheit for thirty minutes. They are then placed in a salt solution and made ready for the shipping containers. Administered as a vaccine, the dead germs stimulate the white corpuscles of the blood to combat the disease germs, preventing their multiplying in the system. This is what occurs in the treatments for preventing typhoid fever, pneumonia, boils, whooping cough and other diseases for which vaccines are available. The preparations are of little aid, in fact may

be positively harmful, doctors declare, if given after the disease has been contracted, for the reason that the white cor-

phoid fever, for instance, only since 1904 in this country. During the Spanish-American war, before the typhoid-fever



Left to Right, Lockjaw, Typhoid Fever and African Sleeping-Sickness Bacilli, Each Magnified 1,000 Diameters

puscles already are working to fight the enemy and need no artificial stimulation.

A serum is not made directly from germs, but from the blood of a horse or other animal to which a vaccine has been administered. It acts as a poison and is intended to combat the disease germ directly as in lockjaw and diphtheria.

Preparing food for the germs requires the utmost care in order that foreign microbes may not contaminate the vaccine. It is thoroughly sterilized, weighed and measured and kept at an even temperature in bottles sealed with cotton. Often the kind of food on which the germ thrives gives a clue to its identity.

As a check against mistakes and before a germ is admitted to "recognized standing" in the scientific world, four tests have been applied. First of all, the germ must be found, it must then be reproduced by culture in some medium, inoculation must show that it really produces the disease it is supposed to cause, and after that, the germ must be recovered from an animal or person suffering from the disease. By this cycle of tests, the nature of the germ is established and it can be raised with a certain degree of assurance that it will produce the expected results. Many germs under cultivation in laboratories have not yet passed these tests. Among these are the influenza germ and that which causes small-pox.

Evidence of the effectiveness of these beneficial microbes in saving human lives is plentiful, but figures gathered by Dr. C. C. Pierce, director of the third district of the United States public health service, from army records are cited as proof of the value of the use of such means of combating disease, a method which has been practiced in the fight against ty-

vaccine was used, one man out of every six of the 175,000 called to the colors contracted the disease, and there were 1,580 deaths. In the World War, with nearly 4,000,000 men in the service, only one out of every 3,800 contracted typhoid, and there were but 213 deaths from it.

Some of the varieties of germs under cultivation are so delicate that they must be kept at constant temperatures day and night. Some thrive best on food in which egg is a chief ingredient and others manifest a taste for alcoholic substances.

FORT TURNED INTO LIGHTHOUSE TO GUIDE NIGHT FLYERS

Inland lighthouses, like those that direct ocean vessels from points of vantage near the shores, have been established in France to guide night traffic by air. They supplement landing field signals and are intended to prevent such accidents as occurred in this country not long ago when Pilot Charles H. Ames of the mail service crashed into a mountain top in Pennsylvania. Two beacons already have been erected, one at Paris, and the other at Dijon, the crossroads of the air lanes. In the latter city, the lamps, of 1,000,000,000 candlepower, capable of throwing their rays more than 200 miles on clear nights, have been installed in the tower of an old fortress which stands on the summit of a hill. Reserve motors and transformers have been placed in the lower part of the structure, and the light is reached by winding stairs to the top of the tower. The lamps are fixed upon two revolving platforms and can be adjusted to give either two or four shafts of light. Sometimes the beams appear to sweep the horizon like the huge arms of a horizontal windmill.

L. Illustration

*Star 10/15/25
Kansas City*

Latest Developments in Field of Science

new York City
John D. Hammond Jr. Worcester, Mass.



Wide World
258-259

Multiple System of Radio Transmission Promises New Usefulness for Wireless; Eight Telegraphic Code Messages Were Broadcast Simultaneously on This One Transmitter and All Were Registered on a Single Receiving Set; the Process Involves a Short Carrier Wave at 30,000,000 Vibrations per Second on Which Are Impressed Several "Modulatory Waves"



100 E. 42nd St.
new York City

International



"Snow" with Temperature of 110 Degrees below Zero Frozen from Liquid Carbon Dioxide, and at Left, Safety Mask Which Protects Eyes, Mouth, Nose and Ears in One Unit

Examining Specimens of Pure Metallic Thorium, Sought for a Century and Now Produced by a New Method; the Substance Is Prepared in the Form of Rods, Wires, Filaments or Powder and Is Expected Greatly to Improve X-Ray Appliances and Radio Tubes



165 Broadway
New York

Mr. J. W. Marden, Westinghouse Lamp Co. Research Laboratories

TIME IS TOLD BY FLOWER-BED PLANTED ON CLOCK DIAL

One of the sights at Interlaken, Switzerland, is a flower-bed clock. The blossoms have been planted over the dial of a



Flower Clock at Interlaken, Switzerland; Works Are Below the Dial and Turn Real Hands over the Blossom Numbers

real timepiece, which is tipped up so that passers-by can see the position of the hands. Numbers of the hours are plainly visible against a dark background, and the orbit of the tiny second hand is divided into four sections, each indicating a quarter of a minute. The clock is in a sanitarium garden where it may be consulted by doctors and patients.

WHITE CUFFS FOR BUS DRIVERS AID NIGHT SIGNALING

So that their hand signals may be seen more easily both by day and night, the



Cuff Attracts Attention to Arm Signals

uniforms worn by London bus drivers are being fitted with broad white armlets that extend from the wrist nearly to the elbow. They are particularly plain at night when light is directed upon them, giving ample warning to drivers behind to prepare for the turn or stop of the bus.

SAFETY GAS TANK PUNCTURE AND FIRE-PROOF

Although penetrated by explosive and incendiary bullets, a gasoline tank for an airplane did not catch fire or even leak after tests in Vienna. It was of the usual metal type, but was lined with a secret composition something like the material placed inside automobile tires to prevent punctures.

A special mechanism inside the container eliminated the effects of the explosive projectiles. Flaming bullets were instantly coated with the lining material on piercing the tank. This extinguished the blaze and also prevented phosphorus-coated bullets from leaving a deposit. After twenty rounds of ammunition had been fired into the tank without any bad results, it was placed in the airplane which then made an hour's flight, using only gasoline from the apparently perforated tank. No leak, fire or other trouble occurred.

MUCK TRIAL IN MODEL COURT TESTS LIGHT AND SOUND

Before the wheels of justice were started in a St. Louis court, a jury of judges, lawyers and building experts sought the best ventilation, light and acoustical properties for the courtroom by staging a mock trial. Theater trappings were borrowed and an area, the size of the room as it would be when finished, was walled off. A court stenographer, clerk and volunteer jury were arranged in their usual locations. As the trial proceeded, if the judge's desk seemed improperly placed, it was moved; witnesses and stenographers were shifted and the jury box was changed to afford its occupants the best opportunity to hear. Results of the tests were incorporated in a model plan for all the courtrooms in the building.

data - no other

Auckland news 10/8/25

Tilling Bureau

601 Keystone Co., a new
 91-7 to New York.
 Behind Scenes in the Lighthouse Service



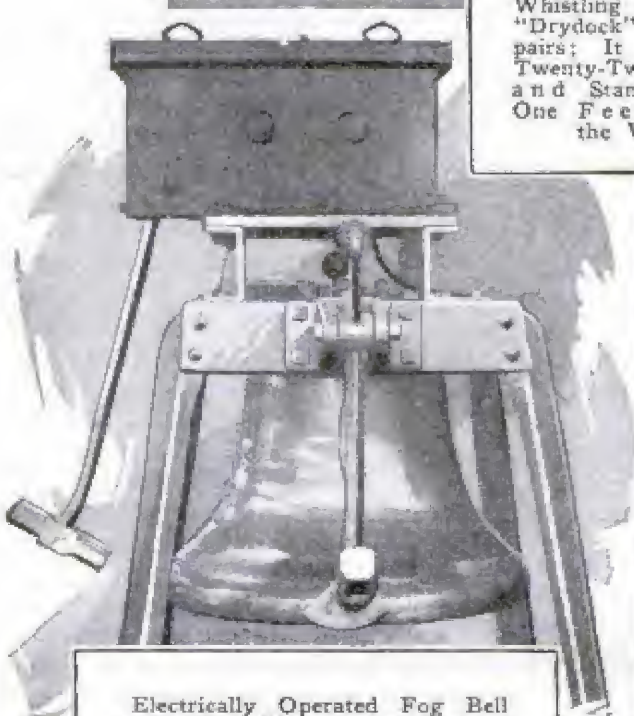
Putting New Super-
 structure on the Cape
 Charles Lightship, a
 Floating Steamer
 Guardian



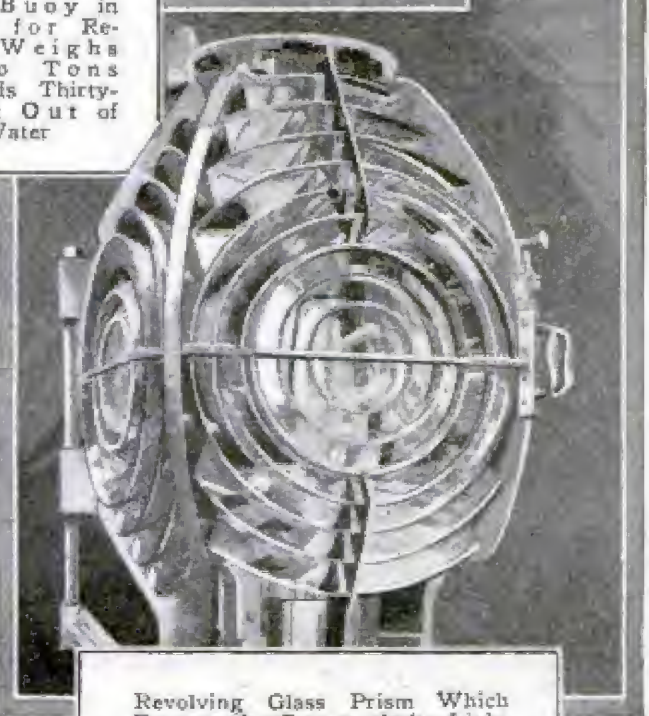
Operated by Com-
 pressed Air, This Siren
 Bellows Fog and
 Storm Warnings



Whistling Buoy in
 "Drydock" for Re-
 pairs; It Weighs
 Twenty-Two Tons
 and Stands Thirty-
 One Feet Out of
 the Water



Electrically Operated Fog Bell
 with Two Hammers, a Feature
 of Up-to-Date Lighthouses



Revolving Glass Prism Which
 Focuses the Beams of the Light
 for Distant Visibility

© Keystone

SPECIAL HARP FOR JAZZ MUSIC PLAYED LIKE GUITAR

Features of the harp and the guitar are combined in a special instrument that has



Playing the Six-Stringed Jazz-Band Harp-Guitar; Its Size Commends It for Orchestra Use

appeared in London for jazz bands. It is played with pick and steel, has six strings, and the shape of the sounding chamber is said to produce effects particularly suited to modern dance music.

TRUCK SERVES AS SNOWPLOW, SWEEPER AND FIRE ENGINE

Principles of the snowplow, the street sweeper, sprinkler and fire extinguisher



Combination Truck in Action; Plow for Scraping Snow or Dirt in Front, Street Flushers at Sides, Operated by Powerful Pumps

have been combined in a motor truck introduced in Germany. The shovel is carried on a frame in front and can be adjusted to various heights and angles, while water for cleansing the pavements and sidewalks is forced out through vents from a large supply tank. Hose connections are provided, when the truck is to be used for fighting blazes.

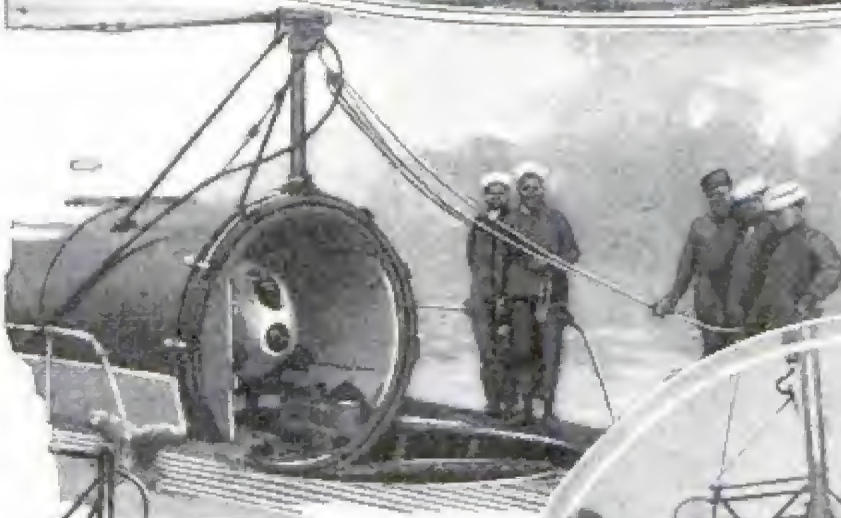
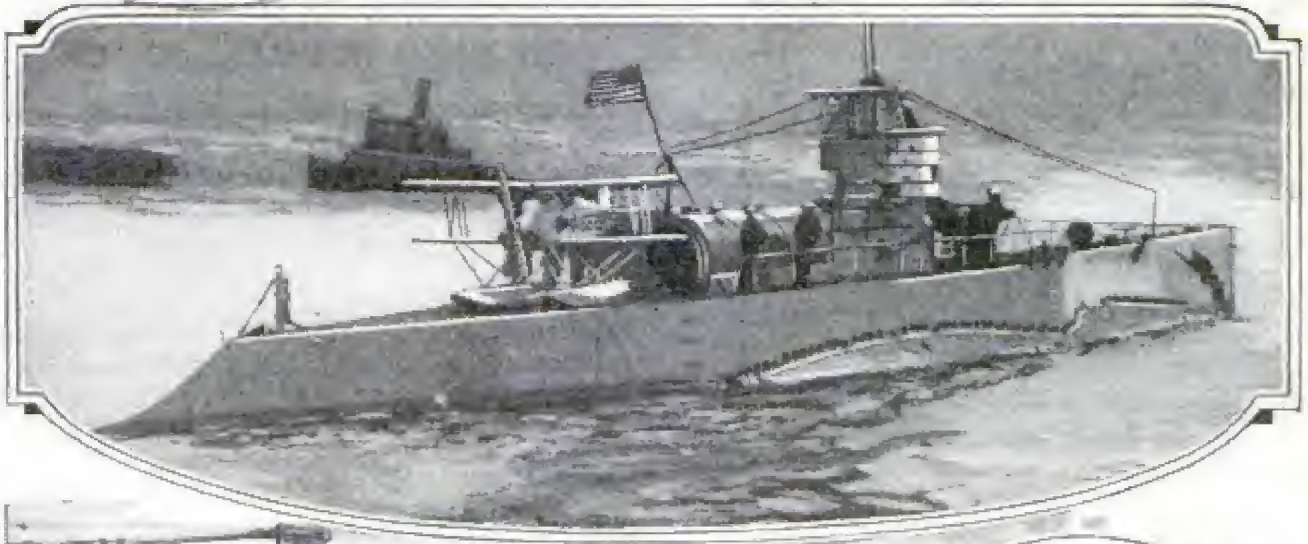
PLANE CARRIED ON SUBMARINE IN CIRCULAR TANK

Submarines may carry their own airplanes to help direct torpedo fire as a result of naval experiments. A circular tank, similar to those used in transporting oil was installed on the deck of the submarine "S-1," and a hydroplane, with its wings removed, stowed into it. When the "sub" had risen to the surface, the end of the tank was removed, the wings attached and the plane made ready for flight. The limited space on the deck of the submarine added to the difficulty of the experiment, but this is not considered a serious hindrance to the success of the plan.

CLUE TO "MISSING LINK" FOUND IN SKULLS CENTURIES OLD

Discovery of mammal skulls, probably 10,000,000 years old, in the Gobi desert of Mongolia, may help link the life of the present with that of the remote past, scientists believe, and further strengthens the theory that that part of Asia was the cradle of existence. The bones belonged to animals about the size of rats that lived at the supposed transition period between reptiles and mammals. Although no human bones were found, extensive traces of man were unearthed in the form of implements, drawings and weapons. The expedition, sponsored by the American Museum of Natural History, also found a huge petrified forest in Asia that probably was the ancestor of the California redwoods, and obtained what is considered conclusive evidence that Mongolia is the oldest continuously dry land in the world.

Submarine Serves as Airplane Carrier



Seaplane on Submarine Deck Ready for Flight, and View of Storage Tank with End Removed to Show Nose of Plane Tucked Away After Wings Were Taken Off



Tackle for Lifting Plane So That Wings May Be Attached or Unfastened for Storing, and Ship on the Water; to Launch It, Submarine Simply Ducks and Leaves It Floating



677 District National Bank Bldg Washington, D.C. *Wm. C. B. ...*
 12 POPULAR MECHANICS *M. Fairchild, Fairchild*
airplane ref. Co. Ld.
Harmindale Ld.
 BRAKES HELP STOP AIRPLANES
 TO LAND IN SMALL SPACE *M 4*



Forester Taking a Close-Up Aerial View with Aid of Special Tripod to Show Vegetation

CAMERA IS HUNG FROM TRIPOD TO TAKE PHOTOS VERTICALLY

Foresters in the Crater national reserve in Oregon use a portable tripod arrangement in taking pictures to show the ground conditions of the area. The camera is suspended from a pole supported by the tripod and is hung in such a way that the lens points directly downward. The height of the pole is easily adjusted and, with the distance known, the camera can be focused accurately. Exposures are made by pressing the bulb to avoid jarring the instrument. The resulting photographs are virtually close-up aerial views and give detailed analysis of vegetation, soil conditions and growth of young trees far more completely than would be possible in pictures taken at an angle, foresters declare. The area included in the exposure can also be determined.

Constructed as part of the wings and operated by a lever from the cockpit, brakes for airplanes have been devised to permit the ship to land in small fields. Wind-tunnel tests indicate that the attachments reduce the speed in landing by twelve per cent. They are similar to the ailerons and the handle is like that of the emergency brake on an automobile. Aviators predict that they will increase the usefulness of the airplane, as there are few styles at present that can be landed safely within restricted areas. The brakes were designed especially for a monoplane to be used in aerial photography. It will carry five passengers, has a camera cabin with darkroom, and tanks for water, for developing and washing the pictures while on flights, are installed in the wing. If the brakes prove effective, landings for quick delivery of photos can be made.

ROLLING HOME WITH SIX ROOMS RELIEVES HOUSE SHORTAGE

Portable houses equipped with modern conveniences have appeared in Nice, where the annual influx of tourists taxes the hotels. The homes are designed like cars, occupy but small space and contain a living room, dining room, bathroom, two bedrooms and kitchen. They are easily hauled and, when in use, are anchored by stout supports on the sides and ends.



All the Comforts of a Hotel on the Sidewalk; Rolling Six-Room Home for Tourists Visiting Nice

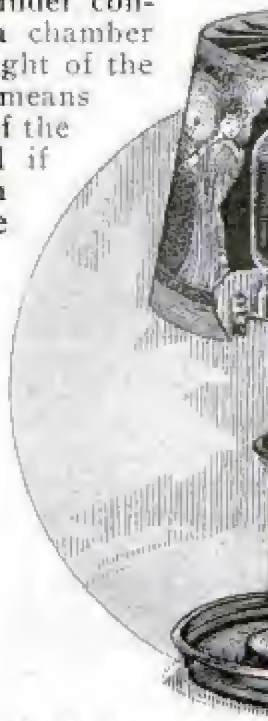
Saken in the Promenade
W. H. France

WEDDING RINGS OF OLDEN DAYS
MADE OF AGATE AND IRON

While sentiment has demanded that wedding rings should be made of the most precious and durable of metals, wives of the ancient Romans sometimes wore bands of iron as a token of ownership or fidelity, and some of the earliest rings were of agate. Since platinum has superseded gold in value, rings of this metal are common. Gold rings were worn by the Egyptians as early as 2000 B.C., but they had no matrimonial significance. The symbols indicated orthodoxy in the households of the early Christians, and finger rings were first used as seals to identify papers. In America, rings were not always popular. The Puritans believed that they were too suggestive of charms.

CANDLE THAT BURNS KEROSENE
SERVES AS VAPORIZER

Resembling a candle set in a metal holder, a small lamp that burns kerosene, gives practically the same illumination as a tallow taper without the bother of frequent renewals and untidy wax. The upright portion is a cylinder containing a wick and a chamber for the fuel. The height of the flame is regulated by means of knobs on the side of the chimney base, and if needed, a small basin of disinfectant may be placed above the light on a special holder so that its vapor will purify the air. The shades are decorated with a number of patterns and colors and some are equipped with a tiny heat "motor" so that they revolve when the lamp is lighted. The glow is sufficient for a sick-room night light.



Candle Lamp with Revolving Shade of Disinfectant Mixture

GARAGE FOR BABY CARRIAGES SERVES CITY FAMILIES

Forty-three families in a model tenement in New York have a common garage for their baby carriages. It is a low.



One Solution of the Small-Apartment Problem; Community Baby-Carriage Garage, Readily Accessible in Court and on Street Level

waterproof shed, with padlocked doors, in a convenient court and spares the mothers the trouble of taking the vehicles to their apartments. Each family contributes five cents a week toward the rent and maintenance of the garage. 712

RESEARCH WORK BY INDUSTRIES SAVES HALF BILLION YEARLY

American manufacturers spend nearly \$35,000,000 each year in research work, according to estimates prepared by the United States chamber of commerce, but the investment is said to save \$500,000,000 annually in the conduct of industry. Many of the large trade associations spend more than \$20,000 each every year to find out how to improve their business. A canners' organization is reported to have an annual budget of \$120,000 for this purpose, and a building-material association spends \$100,000 for work of this kind including laboratory experiments.



Candle Lamp with Revolving Decorated Shade; Pan
- of Disinfectant May Be Set on Chimney

Aladdin of Industries
601 W. Lake, Chicago.



Arrival of the Motor Cavalcade on the Shores of the Indian Ocean after Crossing Africa from the Mediterranean Coast; This Section Reached a Kenya Colony Port

Through Darkest Africa by Motor Car

French Expedition, in Eight Machines with Caterpillar Treads for Rear Wheels, Links Ends of the Continent in 12,000-Mile Dash

LINKING Algeria and Morocco, on the Mediterranean shores, with Cape Town, at the southern tip of the continent, and Daressalam and other towns of the Indian ocean, a French expedition of seventeen explorers, has come out of the jungles after taking motor cars where they had never been seen before.

The equipment included eight specially designed automobiles, with standard front wheels and balloon tires, but with caterpillar tread in the rear. They were so loaded that each two cars formed a separate self-sustaining unit. After starting from Colomb-Bechar, on the Morocco-Algeria frontier, and traveling more than 5,000 miles together, two cars left the others at Kampala, on Lake Victoria, near the headwaters of the Nile, and traveled eastward along part of the route Stanley took when he was hunting Livingstone. They crossed Uganda and Kenya colony, and finally reached the Indian ocean at Tanga and Mombasa.

The other six continued south across

Lake Victoria to Mwanza and then on to Tabora, in the Tanganyika territory, where the party split in three parts. One pair of cars went east, 400 miles or more, to Daressalam, on the Indian ocean and another south to Lake Nyasa, down the west side of the lake, rounded its lower end, and by way of Zomba continued on to Mozambique on the Indian ocean.

The remaining unit branched west from Tabora into the Belgian Congo, through a region of steaming equatorial jungles and reached Kabala, a Belgian military outpost. From there they followed up the Ludlaba river, moving south to Elizabethville, named after the Belgian queen, and eventually reached northern Rhodesia at Broken Hill. From there on the journey lay through the British section of south Africa, crossing the lands of the once warlike Matabele by way of Bulawayo, their old capital, and into the Transvaal to Pretoria and Johannesburg. From the old Boer towns the route led southwest to Kimberley and to Cape Town.

*Auto
Travel*





Cubist Photographs like Cartoons, Emphasizing the Traits of Three Prominent Men of France; from Left to Right, President Doumergue, Aristide Briand and M. Painlevé

PHOTOS TAKEN IN CUBIST STYLE REVEAL CHARACTER

By a process of photographing the various planes of the face, and reproducing them in a composite portrait, a French artist takes pictures resembling cubist paintings. The method accentuates the features in such a way that the characteristics of the subject are emphasized. The finished picture has the appearance of a carefully arranged pattern of lights and shadows in geometrical shapes.

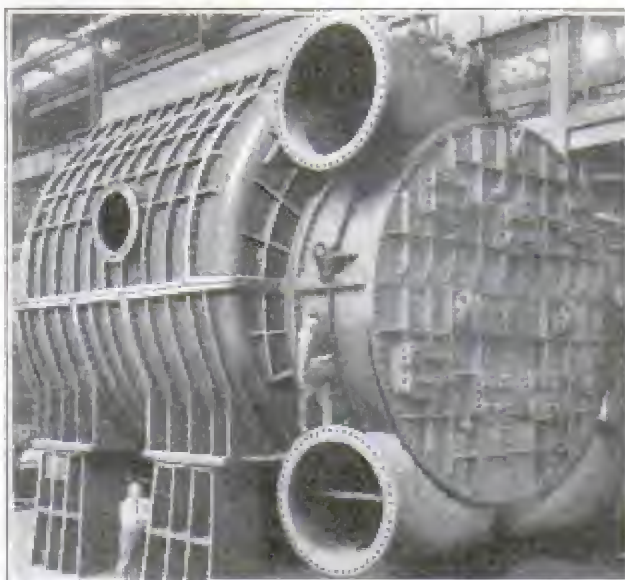
GIGANTIC STEAM CONDENSER WEIGHS MILLION POUNDS

The size of a large eastern power plant is illustrated by a single detail such as the condenser unit to convert exhaust steam from the turbines into water. It is nearly thirty feet high, weighs almost 1,000,000 pounds and contains more than fifty-one miles of tubes. When its two pumps are operated simultaneously, they have a joint capacity of 144,000,000 gallons of water every twenty-four hours, nearly half that of the combined waterworks and pumping stations of the

city of Philadelphia. The main condenser has a cooling surface of 70,000 square feet. After the unit had been assembled, it was dismantled for shipping to its destination. Twelve condensers of this giant type are contemplated in the final plans of the huge power plant.

VALUE OF WEATHER FORECASTS SHOWN IN INDUSTRIES

Timely warnings of approaching storms or cold sent to the public from the weather bureaus, annually save thousands of dollars to shippers and manufacturers. An example of the benefit of the service was seen recently when a large concern, using 27,000,000 gallons of lake water a day, shut down in time to prevent serious damage to its equipment because of a sudden fall in the lake level. Changes in weather conditions were noted by the observers who informed the company officials that a fall of a foot or more was likely between noon and evening. The prediction came true, but the machinery had been stopped in view of the warning and no harm resulted.



Huge Steam Condenser Weighs Nearly Million Pounds and Has Over Fifty-One Miles of Tubes

Westinghouse Electric & Mfg. Co.
South Philadelphia, Pa.

Nov. 1925
Machinery

Alser - Philadelphia Electric Co.

SPEED OF SIX MILES A MINUTE
PREDICTED FOR AIRPLANE

After attaining a speed of 302.3 miles an hour, an unofficial world's record up to that time, with a 2,200-pound Curtiss racer, Lieut. Alford Williams, U. S. N., declared that he believed he could better that rate by nearly fifty miles. The tremendous momentum was gained by diving from a height of 3,000 feet and then "flattening out" on a straight course. A drop of 9,000 feet would permit the six-mile-a-minute pace, Lieut. Williams believes. The racing plane measured twenty-two feet from wing tip to tip, by nineteen feet eight and one-half inches long and eight feet one inch tall. The material in the wing-type radiators is thinner than the average sheet of paper, and water circulates at the rate of seventy-five gallons a minute. The propeller is of duraluminum. It is not damaged by rain, hail or tall grass and can be bent without breaking. To test the strength of the wings before the flight, bags of shot equaling the weight of fifteen automobiles were piled upon them, both when the plane was in a flying position and upside down. The cockpit is so sheltered that it would be impossible for the pilot to free himself, but a pull on a wire automatically opens it and allows the aviator to leap out.

~~MOTORCYCLE~~ WITH CHAIR SEAT
RESTS RIDER'S BACK 422

Motorcycles with chair seats have appeared in London, affording the rider greater comfort in a support for the back and in a broad cushion. The outfit is, in effect, a two-wheeled automobile with a windshield, headlight and broad mudguard in front. The frame is built low and is supported, when at rest, by a drop brace under the seat.

A black and white photograph of a man sitting on a motorcycle. The motorcycle is a vintage model with a large, boxy body that resembles a small car, featuring a windshield and a broad mudguard. The man is wearing a dark jacket and is looking towards the camera. The motorcycle is parked on a light-colored surface.

© Keystone View Co.

Comforts of the Automobile Are Enjoyed in This Motorcycle with High-Backed Seat and Windshield.

at Zondan Motorcycle
Ex. Int. & Pl. 15-4-00

IRON CROSS TEN FEET HIGH
MARKS MOUNTAIN TOP



Defiant of Winter Storms, Iron Cross, Guyed to Rocks,
Caps Alpine Mountain Crest

Strongly anchored to the rock, a ten-foot iron cross marks the wind-swept summit of Gross-Glockner, an Alpine peak on the borders of Salzburg and Tirol, 12,455 feet above sea level. The peak has been a favorite objective of mountaineers since 1799, when the first attempt was made to reach its top. Some peasants reached the goal the following year.

CHECK PROTECTOR FITS FINGER
AND IS WORN AS RING 560

Worn as a finger ring, a check protector devised by an English business man has sharp, milled edges that puncture the paper in any desired direction. It is designed as a substitute for more costly outfits, and is used by laying the check flat, clenching the fist and drawing it across the slip. The ring, being loose-fitting, turns on the finger as a wheel.

Mr. H. George
George H. Hilday, Esq.
Highfield View, Tapton Union Road, Chesterfield, Eng.



Bird "Apartment House" Made Secure from Cats by Tin Sheeting Wrapped around Tree Trunk

TIN BAND AROUND TREE TRUNK KEEPS CATS FROM BIRDS

Cats cannot reach birds in a commodious "apartment house" an eastern man has built for them, as the supporting tree is bound with a band of tin, presenting a surface too slippery for the marauders to climb. The house has room for many inmates, and besides the usual nesting places, has a replica of a garage and a filling station to make it up-to-date. The birds apparently know that cats cannot reach them in these shelters and flock to the house in great numbers each season.

DEADLY WAR GAS PROTECTS PLUMES

Poison gas was used to guard a case of costly plumes of the bird of paradise and other rare fowls shipped to a museum in Baltimore, Md. A sign on the outside warned, "to open this

case is to court death." Thus anyone bent on stealing the valuable contents would have only himself to blame if he came to grief by tampering with the package.

Baltimore, Md.

ELECTRIC-POWER LINE TO LINK CITIES OF SIX STATES

639 A 182,000-volt transmission line between South Bend and Michigan City, Ind., will link Chicago with cities in Ohio, Indiana, Pennsylvania, West Virginia and Kentucky, enabling centers to borrow power from each other in emergency, as well as providing a means of interchange between plants in the same city during peak hours. The line is expected to be opened next March. It is considered one of the largest links in the proposed interlocking of power plants throughout the nation. The cables are strung on steel towers nearly 100 feet high, and the erection of two huge generating plants, one of 120,000 and the other of 2,000,000-horsepower capacity, is included in the project.

*Calumet & Hecla Co.
American Lumber Co.*

TOBACCO-LEAF COFFEEPOT IS FAIR ATTRACTION

567 Among the exhibits at a Georgia fair was a realistic coffeepot woven of large tobacco leaves, the product of one of the counties of the state. Held at an angle as though liquid were being poured from it, the display attracted much attention.



Southeastern Fair



Jagged Piles of Ice Repel the Supply Tug and Make Landing on the Water Cribbs a Difficult Task, While Often the Floes Block the Lake for Miles and Render Aid Impossible

Icebound in Sight of City's Lights

Keepers of City's ^{Supply} Water Cribbs Frequently Storm-Bound for Month or More in Plain View of Teeming Millions Ashore

STORM-BOUND for day after day, with food supplies running short while, three miles away, millions of people are going about their daily business, is a frequent winter experience of the men who man the water cribbs in Lake Michigan, off Chicago's lake front. By night, when thousands of lights gleam along Michigan avenue they can pick out the brilliantly lighted hotels and restaurants, where hundreds are dining, and watch the endless procession of moving automobiles whose occupants are bound from home to dinner, from dinner to theater, and then on to a midnight supper.

The water cribbs are the intake pipes of the city's water system, connected with shore by huge tunnels driven through the solid rock far below the lake bed. A powerful tug, formerly in the navy's sea-going fleet, acts as tender and carries sup-

plies to the crib crews, but every winter there are recurring periods, when the ice floes are piled so deep off the harbor mouth that the boat cannot buck its way through.

When that happens, the crib keepers cut down rations and tighten their belts, for only a rising thermometer, accompanied by a shift of the wind from northeast to west or southwest can bring relief, and nobody knows when that will happen. Thirty and forty-day periods icebound on the cribbs have happened, and two to three-week spells are quite common.

Ordinarily the crib keepers are relieved every week, getting a week ashore after each week at the water gates. In good weather, when such reliefs are possible, the tender tug gets around to each crib every couple of days bringing fresh meat and vegetables, newspapers and other sup-

plies to them. The upper end of Lake Michigan does not freeze over its entire expanse even in very cold weather, because the water remains warmer than the atmosphere. But along the shores, and at times for several miles out, ice forms in periods of calm, and breaks off to go cruising about the lake when the wind shifts and kicks up a storm. In the harbors and more protected spots, ice of six to ten inches' thickness is common, while one to two inches may stretch for several miles off shore. As winter progresses, the ice floes, fed by the repeated breaking loose of shore ice, assume prodigious proportions. Piled up by shifting winds, the ice

Barrels of Fresh Meat Are Hauled Ashore by the Hungry Crib Keepers



field may reach a depth of several feet and cover an area of a hundred or more square miles.

When the winter northeasters blow, the ice field is driven down on the Chicago shore and piles up for several miles out in the lake. A few years ago a steamer was icebound for two weeks six miles off Chicago's loop district, and the grinding ice wedged under

it so much that the boat was lifted bodily a half dozen feet above the lake level. Coast guards with a lifeboat mounted on sled runners, and an airplane from a meat-packing plant delivered supplies to the unlucky seamen and averted a famine.

Life on the cribs during such winter weather is one round of hard work. The center of each crib—of which there are five—is a



One of the Stone-Walled Cribs in Winter; Often the Northwest Gales Will Send Tons of Green Water High over the Roof, Frequently Breaking the Windows Forty Feet above the Lake



Copyright, Underwood & Underwood

The Lonely Crib Keeper on a Clear Winter's Night Can See the Lights of the City Where Teeming Millions Are Living in Comfort at Home, Free to Go Where They Please

huge circular well, with thick stone walls. In the middle of the well the intake pipe from the tunnel to shore rises almost to the lake level. In the outer walls a series of portholes admit the water to the well, and it then flows down the intake. The well room is surrounded by a two-story circular house, with living quarters on the upper floor, forty feet or more above the water line. Despite their height, great green seas frequently break over the coping of the lookout balconies and go crashing through the rooms.

Three men man each crib in summer, when the only work to be done is cleaning the intake screens every couple of hours. But in winter, when ice constantly threatens to close the portholes and intake, the crew is increased to eight, two working on each six-hour shift.

Heavy surface ice which forms over the well pool presents no danger, but the bugaboo of the crib keeper is anchor ice, which at first is of the consistency of taffy and clings to everything. Under certain temperature conditions water will freeze to any obstruction, even though the current is considerable. When that happens, the portholes, intake pipe and every part of the underwater structure begin piling up with ice. A string dropped into the well pool and pulled up

will be covered by a coating of ice. Then there is nothing to do but rout out the entire crew and set to work with pike poles and dynamite to break and blast away the ice. Dynamite broken into third-of-a-stick lengths is lowered four or five feet below the surface and exploded by electricity, the small charge being sufficient to break the ice loose without damaging the thick stone foundation.

One of the crib keepers, a couple of years ago, devised an "anchor-ice detector." While the other crib crews were standing constant watch day and night, the fortunate possessors of the detector turned in and slept soundly until an electric bell rang over the chief's bed and informed him ice was forming. Rival cribs sent delegations over to get the plan of the new invention. All they could

see was a tightly closed wooden dynamite box resting on the platform grating above the well, with two wires leading to the living quarters, and a string hanging down into the water. Offers were

made to buy a detector at any reasonable price—

and declined. Surreptitious lifting of the box indicated it contained an amazingly heavy collection of machinery. Finally it was opened, and found to contain two small strips of brass and a quantity of paving bricks. The brass strips



Lighthouses on the Cribs Must Be Kept Efficient to Serve as a Warning to Shipping

formed a switch, from which the string, weighted at the lower end with a few links of chain, depended. The weight was just sufficient to almost close the switch and complete the electrical circuit through dry batteries and bell in the chief's room. When anchor ice formed on the cord, the added weight closed the circuit.

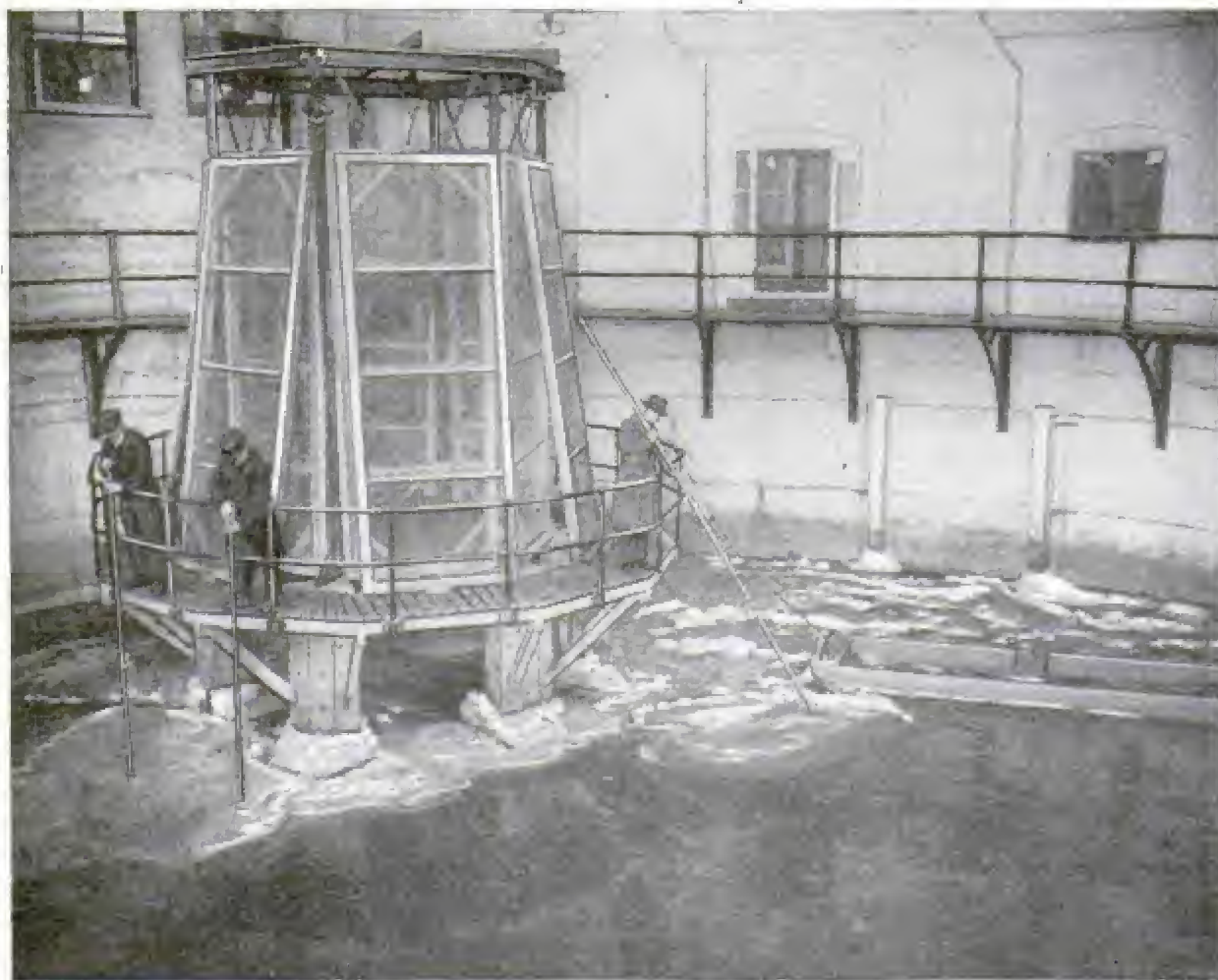
Life on the cribs has brightened considerably since the invention of radio. Previous to that, communication with shore was confined to the telephone, reserved for official business, and the uncertain visits of the tug. Two years ago the city purchased a fine radio set for each crib, and now, day and night, the air keeps the men amused and in touch with events on land. A Chicago broadcasting station sends out news bulletins every half hour, so there is no longer any waiting for the tug to bring out the accumulated newspapers of past days.

The city feeds its "desert islanders" well. An enormously big ice box, placed out on the cold balcony, is kept filled in winter with all kinds of meats and fowls. A sample day's luncheon included two

kinds of meat, peas, potatoes, salmon and boiled-egg salad, bread and butter, pie and coffee—and second or even third helpings are permissible. One of the noticeable facts on the cribs is that only the cook and his helper are kept thin by their work.

All refuse from the cribs is burned in incinerators instead of going down a sewer. The waste water from the kitchen sink and bathroom, which can't be burned, passes through a chemical plant for treatment, and a city health officer makes frequent visits to take samples and see that the treated water is absolutely free from dirt and germs.

Tending the city's water gates is only a part of the crib men's work. Each crib is surmounted by a lighthouse with a fog bell, since they are obstructions to navigation, erected under war department permits, and subject to inspection by the lighthouse tender. The lights must be kept clean, the acetylene-gas supply working, and at the least trace of fog, the clock-work, which strikes the fog bell at ten-second intervals, must be put in motion.



When Ice Begins to Form around the Intake of the Tunnel Leading to the Water Works, the Entire Crew Must Turn Out with Pike Poles and Dynamite to Keep the Opening Free

Cont. No. 3720 S. Park Ave Los Angeles, Calif.
POPULAR MECHANICS 23
 596

HOUSE BUILT UNDER BUNGALOW TO SAVE MOVING COSTS

Instead of wrecking or moving a bungalow which stood upon his lot, a Los Angeles builder raised the structure on high "stilts" of wooden



Bungalow on Props and on Rear of Roof of Apartment House Built under It

blocks and constructed an apartment house around and under it. The bungalow was incorporated into the larger unit as part of the top floor and could scarcely be distinguished from the rest of the finished house. Uniformity and harmony were achieved by modeling the front part of the apartment's upper story after the pattern of the original bungalow.

CLUE TO OIL WELLS SOUGHT IN HEAT OF EARTH

Oil fields and other valuable mineral deposits may be discovered by measurements of the heat in deep wells, according to a government geologist. Tests of the method have shown, he declares, that there is a direct relation between the temperature and the shape of the folds or strata associated with deposits of oil. By taking two or more such measurements, a clue might be gained as to the location of oil-bearing soils in a given area, it is suggested, saving the expense of useless drilling, as small holes large enough for taking the temperatures could

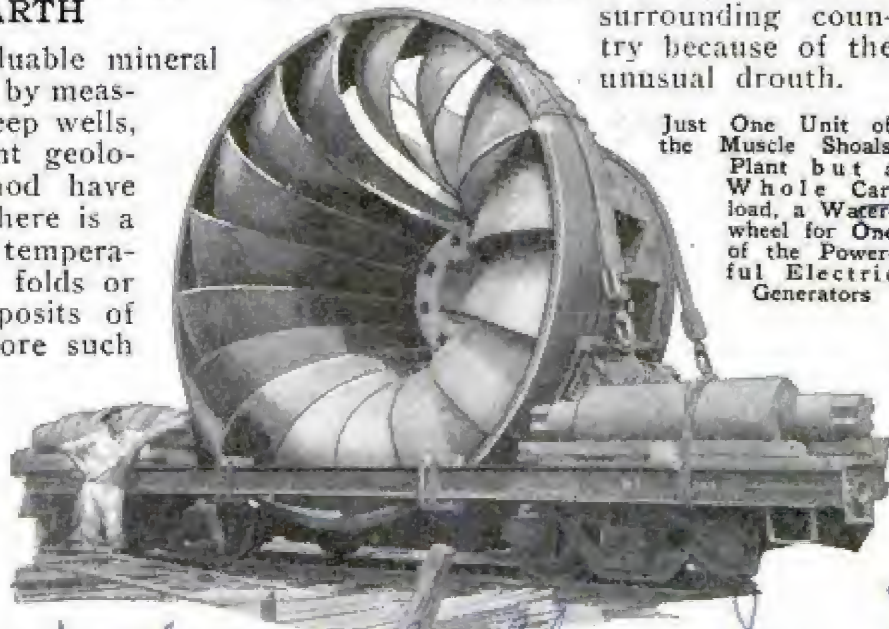
be made with diamond drills at much less cost than that involved in boring a well.

BIG TURBINE FOR WILSON DAM OCCUPIES ENTIRE CAR

The magnitude of Muscle Shoals, an engineering dream that is fast becoming a completed reality, is emphasized in such parts of the equipment as the big turbine rotors or water wheels for the generator units at Wilson dam. A single one of these makes a capacity load for a freight car. The rotor is so shaped that water pours into it in radial fashion from all sides, exerting a twisting effect upon the shaft and a final "kick" on the sloping ends of the blades or vanes before it plunges back into the river. A 30,000-horsepower unit of the plant, placed in service last fall, rendered valuable aid to

surrounding country because of the unusual drought.

Just One Unit of the Muscle Shoals Plant but a Whole Carload, a Water-wheel for One of the Powerful Electric Generators



Statement by W. S. Thom Jr.

Cont. William Cunningham Wood, President of the American Society of Mechanical Engineers

ASBESTOS FIRE-ESCAPE SLIDE OFFERS QUICK EXIT



Demonstrating Use of Asbestos Chute as Means of Escape from Burning Building

Safe and speedy means of exit from a burning building is provided in a canvas-reinforced chute of asbestos. One end is attached to a reel that may be placed near a window or other opening, and the other is held on the ground. The refugee leaps into it and slides quickly to the bottom. The strip is trough-shaped and is strong enough to support heavy weights.

DO APES POSSESS SENSE OF HUMOR?

That chimpanzees have many characteristics like those of human beings has been further established by Prof. Wolfgang Kohler, a German scientist, who spent several years studying the animals in a secluded jungle home on an island off the coast of Africa. He captured nine apes when they were young, gradually tamed them,

and then watched their behavior almost daily to see how they would solve problems set for them. One young chimpanzee indicated what appeared to be a sense of humor. While eating its bread ration, fowls gathered and devoured the crumbs. After that, the ape kept out of reach behind the bars and when a hen tried to peck at the bread, the animal pulled it away in apparent glee. If food was placed beyond the cages, the apes learned to "fish" for it with sticks or with crude hooks they devised from straw, grass blades or rags. One tried to use an old straw hat, doubling and redoubling it when the material proved too pliable to serve as a stick. They also learned to pile up boxes and reach for their food when it was suspended from the top of the cage. The apes grew to know and love their keeper, and on one occasion, displayed their gratitude for being let in out of the rain by affectionately patting and embracing him.

MODEL PLANE IS RUN BY AIR FOR SIXTY SECONDS

Driven by compressed air released against the propeller from a storage tank, a model seaplane constructed by an Englishman, can make a continuous flight of sixty seconds' duration. Air is injected by a hand pump to a pressure of about 180 pounds. The model has a wing span of eight feet, weighs four and one-half pounds and is fitted with floats.



Filling Storage Tank of Air-Driven Model Seaplane

© Henry Miller

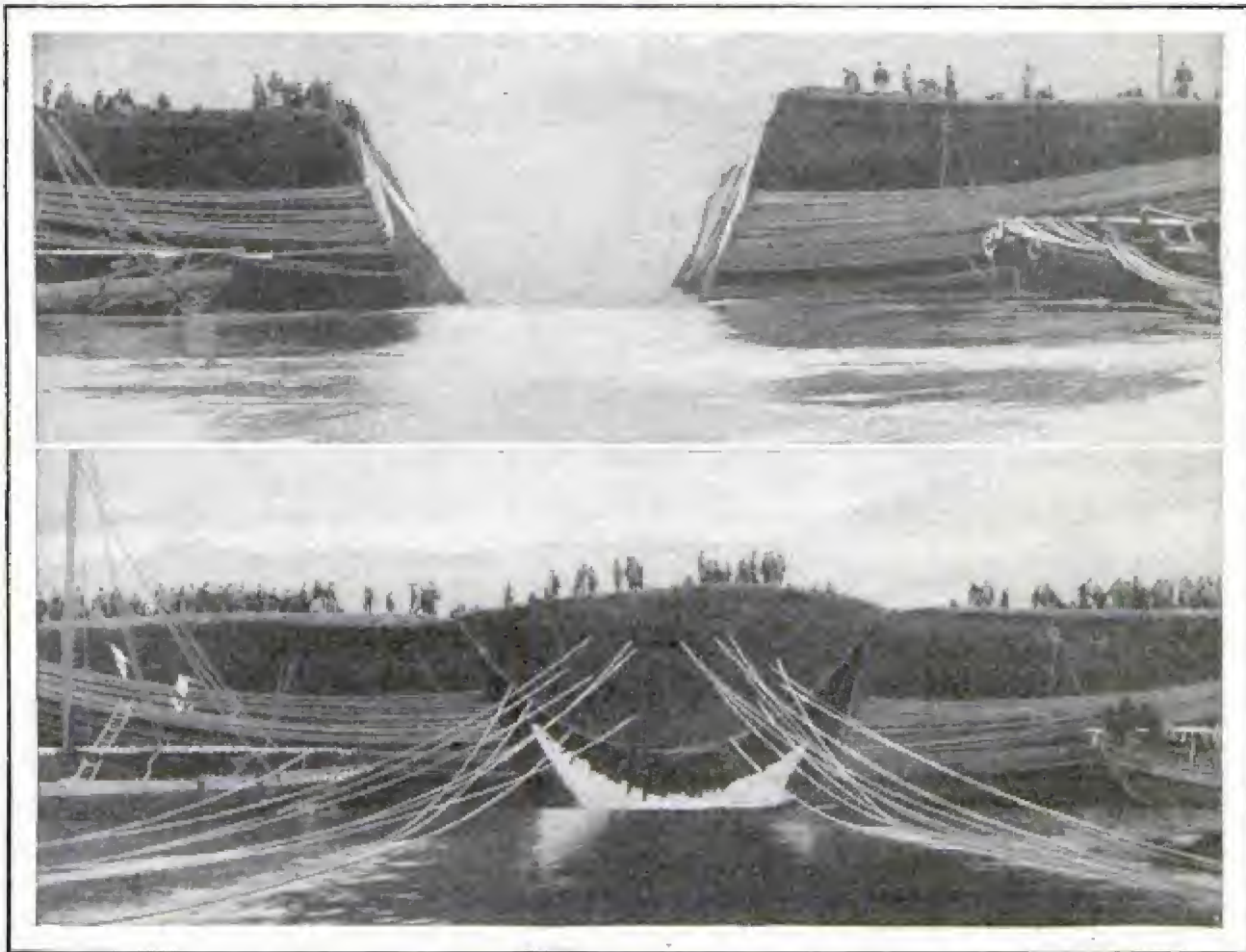
Ed. Oito 10/3/25

Demonstrates at Model Aeroplant Club

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DAM BREAKS ARE MENDED WITH EARTH-FILLED NETS



How the Chinese Repair a River Dam: Upper Photograph Shows the Break and Workmen Preparing the Net: Below, the "Plug" Is Settling of Its Own Weight

When breaks occur in a dam in China, nets of hempen rope are filled with earth and lowered into the cavity, quickly stopping the leaks. Washouts are not uncommon, and the natives co-operate when repairs are necessary, doing, in a few hours, work that ordinarily would require the attention of skilled engineers. 605

MYSTERIES OF SKY INCREASED BY STARS THAT GROW COLD

Scientists are able to weigh the sun, moon and stars, and measure the distances of bodies the light from which takes centuries to reach the earth, but the sky is still full of puzzles and one of them is the problem of the dark stars or those that have grown cold and are plunging through space at tremendous rates of speed. In 1901, a blazing star was discovered in the constellation of Perseus. It was not a new body, but probably the result of a collision between two dark stars or the passage of one through a vast cloud of gas or dust, one of the mysterious areas that are found in the heavens. A Dutch

scientist, three years ago, found one of these clouds which was 140,000,000,000,000 miles long and twice that distance from the solar system.

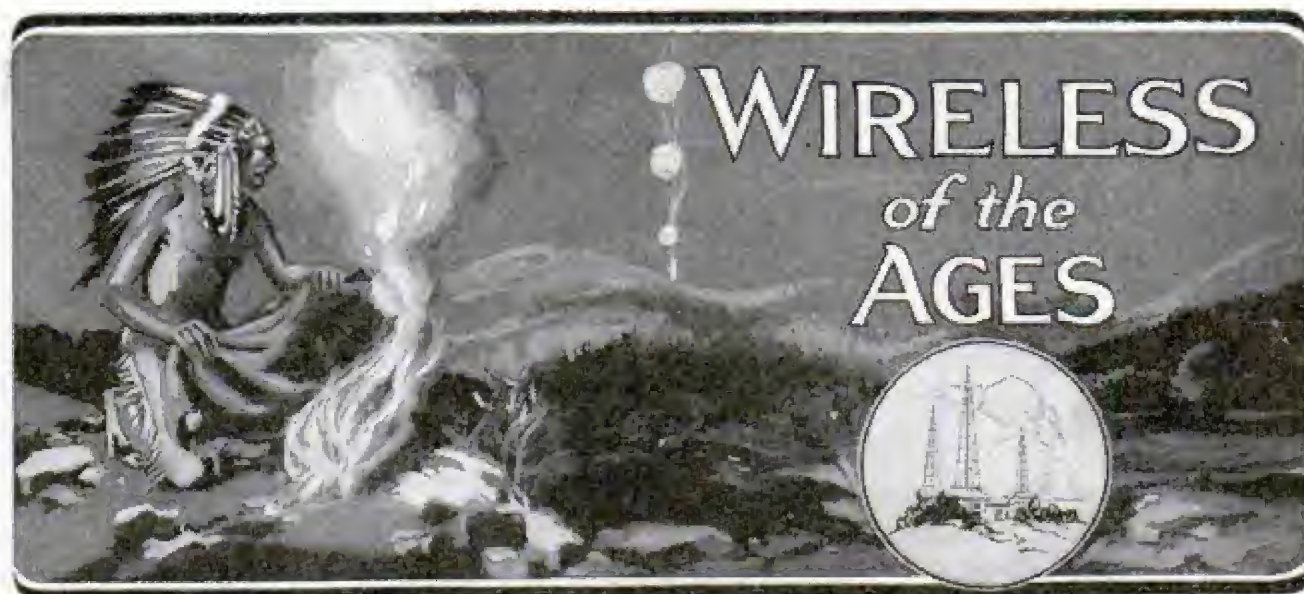
BALLOON-TIRE JACK-FOR-AUTOS GIVES TREAD CLEARANCE

For use in adjusting balloon tires, the screws of an automobile jack are telescoped to give extra clearance needed when raising the car. Since more space is necessary between the rims and the ground for replacing the wider tires than is needed by ordinary treads, the jack is designed with a full extension of seventeen and a half inches.



Ind Post 9/13/24

Waltham L. Pratt
400 State, Lake
Chicago
1903
105
Auto Access



Man's Search for Long-Distance Communication Dating Back Some Twenty-One Centuries, Has Climax in Radio Newspaper

By J. EARLE MILLER

WITH powerful broadcasting stations sending out the news of the world at half-hour intervals to all who care to tune in, a dream more than twenty-one hundred years old has at last been realized.

The radio service given by American newspapers is the last step in the search for some quick and easy means of communicating intelligence over vast distances to many people, a search that started two hundred years before the Christian era.

Even as late as Civil War days, it took a relay of pony-express riders, galloping at top speed, nine days to bring the news to San Francisco when Fort Sumter was attacked. Today one part of the world can know what the other parts were doing half an hour ago.

Yet with the dream realized there still persists one of man's first wireless systems, so old that its origin is lost in antiquity, but probably antedating any white man's civilization.

With radio mes-

sages circling the earth; voice and music being broadcast from continent to continent, and even pictures flashing through 3,000 miles of air, this last of the pre-electric wireless systems—the talking drum—is making its final stand in the heart of Africa, in the jungles of South America, and on the islands of the South Pacific.

In those last outposts of civilization they still roll through the night with their code messages—one of the most efficient "wireless systems" ever developed until Marconi tamed the Hertzian waves.

In the heart of Africa, scores of miles beyond the last white settlement, it is probable that the Wills-Firpo fight of many months ago is still celebrated in song and story, and it is equally probable that the natives knew the outcome within a few hours after the final blow.

When Jeffries was beaten by Johnson in 1910, Thomas Cameron Taylor, a white explorer, was in the heart of the "ju-ju country" in darkest Africa,

SPEEDING THOUGHT

MORE progress in fast communication has been made during the past twenty-five years than in the preceding twenty-five centuries.

Smoke by day and fire by night were first used for transmission of information.

Carrier pigeons have been used for hundreds of years.

Germany equipped the letter carriers with stilts in the sixteenth century to increase their speed.

Among the savage nations, drums are still used to transmit messages over wide areas.

In the United States, stagecoach and pony express furnished the fastest means of communication by letter before the advent of the railroad; but it was not until the invention of the telegraph and later of the telephone and radio that instantaneous communication was established.

The first long-distance message over the telephone was in 1876, from Boston to Cambridge, a distance of two miles. In 1922, the first telephone conversation across the Atlantic ocean took place. In 1924, President Coolidge, sitting in the White House and without raising his voice above an ordinary conversational tone, was heard all over the United States, Canada and parts of Europe.

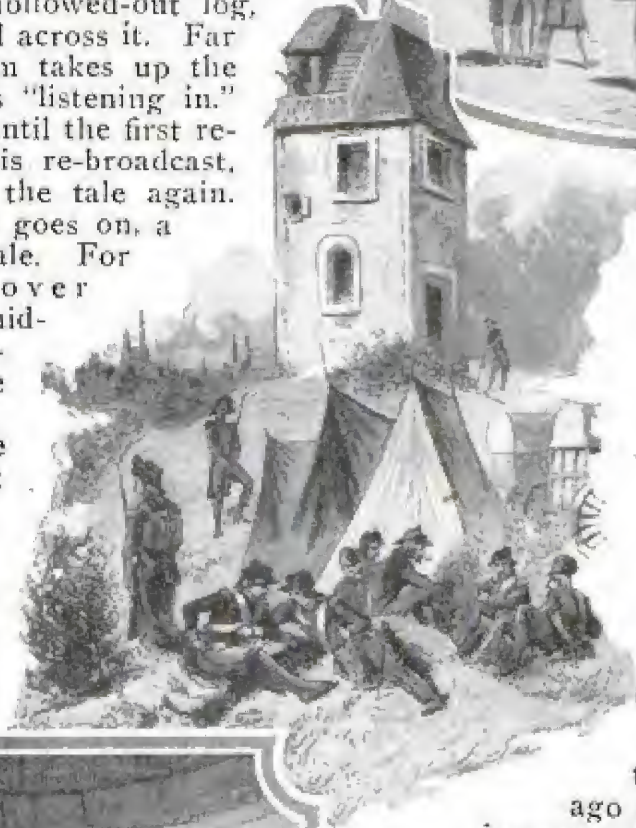
hundreds of miles from the coast and 180 miles from the nearest telegraph line. But within twelve hours after the end of the fight he knew that Johnson had become world's champion. The native drum telegraph was at work.

To a port on the coast, the fight result had come in the summary of the world's news telegraphed by a press association. It was discussed in the presence of the native servants. In a twinkling the news was over the town. In a dirty compound back among the hills behind the settlement a drum begins to beat—a drum fashioned from a hollowed-out log, with a skin stretched across it. Far away a second drum takes up the tale. A neighbor is "listening in." The sender pauses until the first repeater has ceased his re-broadcast, and then takes up the tale again. Bit by bit the story goes on, a long and exultant tale. For hundreds of miles over deep jungles and hidden creeks the rolling drums carry the story.

But the native drum is only the last survivor of more than 2,000 years of wireless experimentation. The Greek runners who carried the news of



Above, Claude Chappe Demonstrating His Clock Semaphore Telegraph in 1791; Semaphore Tower of Napoleon's Army, Center, and the Control Wheel Which Operated the Signal Hands of the Semaphore

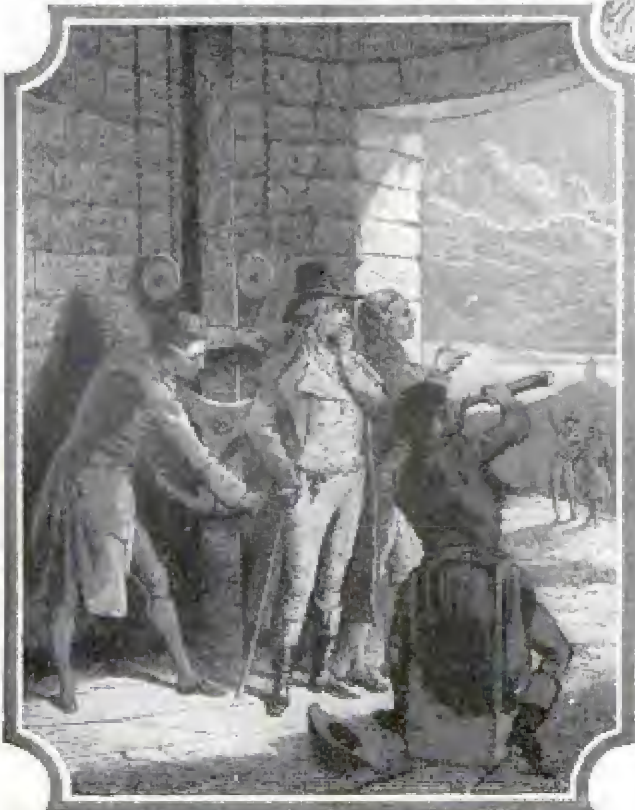


wars and battle were one of the first developments. Then came the primitive signal torches—limited in their application because only prearranged intelligence could be transmitted. Polybius, the Greek historian and inventor, records

their drawbacks as long ago as 208 B.C. and tells of

improvements made by himself

and others. Aeneas, the tactician, was the first to add an improvement. He proposed the use of two jars of equal size, fitted with loose cork floats, in which were stuck long reeds marked in narrow rings, with a message written on each ring. Every conceivable message was included. In use, the sender signaled with a torch to the distant receiving station, where a second torch acknowledged the fact that the listener was "standing by." Both then opened taps in the bottoms of their jars and let the water flow out until the sender raised his torch as a signal that the ring with the proper message had just descended to the top level of the jar. The taps were then closed and the message read, after which the jars were refilled with water. The system, however, was imperfect. Word that an army had attacked or a fleet arrived could be telegraphed, but the message could not tell



how many men were in the army or the number of vessels in the fleet.

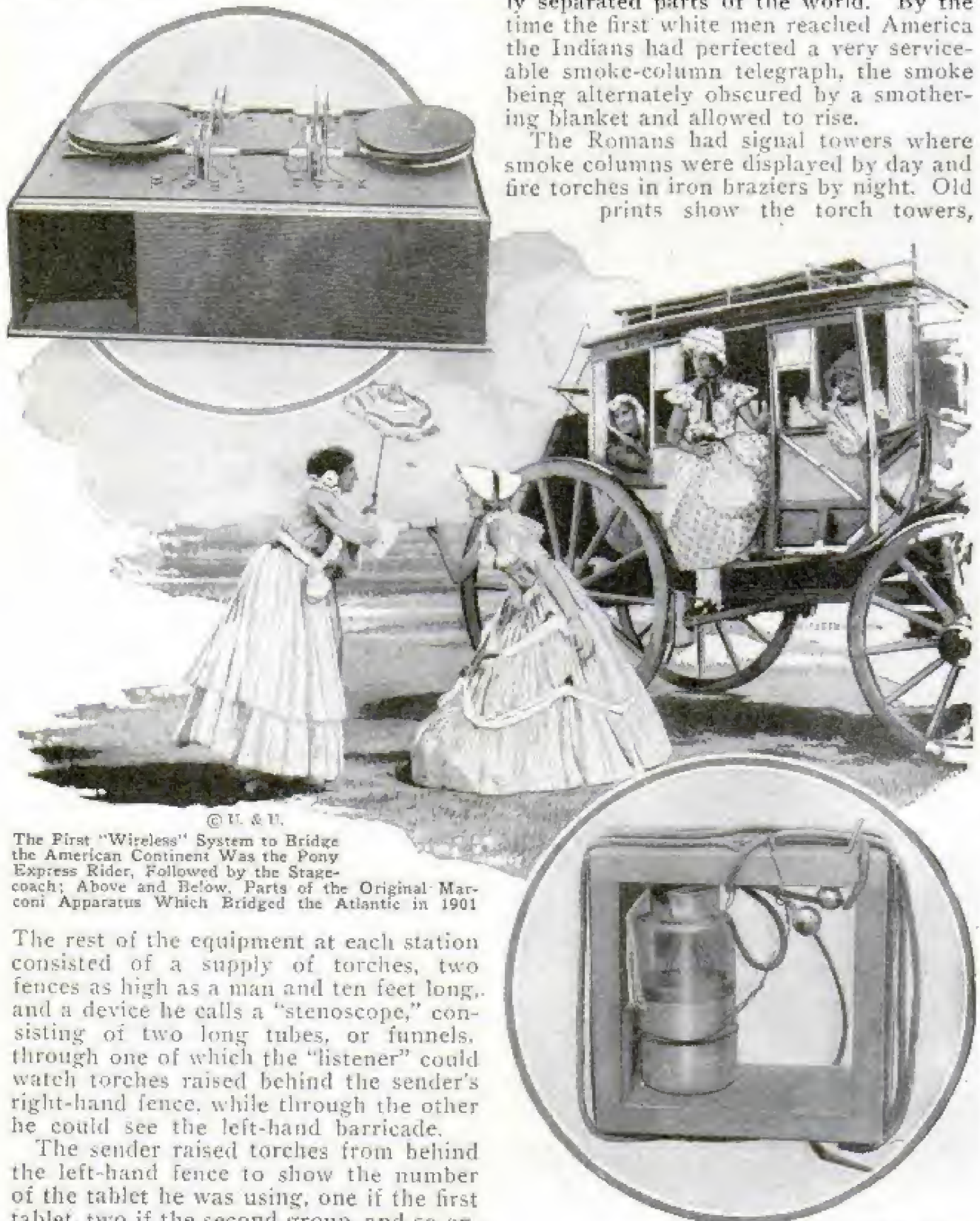
Cleoxenus and Democlitus tried to improve on Aeneas' system, and Polybius himself finally brought it to what he claimed was perfection. He divided the Greek alphabet into four groups of five letters and one of four letters. The sending and receiving stations had the groups written on five tablets, a group to each.

He then raised torches behind the right-hand barricade to show the number of the letter on that tablet, and thus slowly spelled out his message.

The Greeks tried various improvements on the Polybius system, but all were far from satisfactory because of the limitations of distance and also the lack of speed in transmitting.

Development continued apace in widely separated parts of the world. By the time the first white men reached America the Indians had perfected a very serviceable smoke-column telegraph, the smoke being alternately obscured by a smothering blanket and allowed to rise.

The Romans had signal towers where smoke columns were displayed by day and fire torches in iron braziers by night. Old prints show the torch towers,



© U. & U.

The First "Wireless" System to Bridge the American Continent Was the Pony Express Rider, Followed by the Stagecoach; Above and Below, Parts of the Original Marconi Apparatus Which Bridged the Atlantic in 1901

The rest of the equipment at each station consisted of a supply of torches, two fences as high as a man and ten feet long, and a device he calls a "steno-scope," consisting of two long tubes, or funnels, through one of which the "listener" could watch torches raised behind the sender's right-hand fence, while through the other he could see the left-hand barricade.

The sender raised torches from behind the left-hand fence to show the number of the tablet he was using, one if the first tablet, two if the second group, and so on.



Courtesy The Marconi Co., London

Against a Painted Background of Newfoundland Scenery, G. S. Kemp, at Right, Marconi's Assistant in the Historic 1901 Experiment, Reconstructs the Original Apparatus at Wembley Exposition

strongly fortified and protected by wicker fences, behind which fierce dogs prowled to give warning of the attack.

France came to the front with a semaphore system, the two arms being controlled by ropes and wheels inside a tower. A French inventor, Claude Chappe, in 1791, produced an "aerial telegraph" which worked over a distance of nine and one-half miles. A dial like a clock, with letters instead of figures, had a single revolving hand, worked by rods and gears. The dial was painted white and the figures and hand were black, so they could be seen at great distances. It is noteworthy that Chappe proposed to operate the dials by electricity, with a sys-

tem of condensers between the stations, but was never able to make his dream work.

While France in the Middle Ages already was experimenting with semaphore systems, England had beacon fires on every hilltop. Drake got word of the coming of the Spanish Armada in this way, and the news was flashed entirely around England and Scotland. With the development of better cannon, noise displaced smoke and fire, and signal guns grew common.

Up to that time the "wireless" had been used principally for war purposes, to warn of attack and report victory or defeat, but later it gradually was applied to peaceful pursuits. The curfew bell and the morning and evening signal gun, telling of sunrise and sunset,



The African Wireless, a Ceremonial Drummer at the Court of the King of Uganda

still survive. The electrical telegraph got its first war tryout in the Franco-Prussian and Crimean wars. It was not "wireless," but it did get messages across long distances, provided the enemy or a chance shell did not break the wire circuit.

The wire telegraph never quite displaced other "wireless" systems, since it always had the drawback of needing wires, which took time to erect, and were always subject to interruption. The heliograph, a system of sun flashing, remained in use with armies until the World War, and semaphore flags and blinker lights are still used by the world's navies.

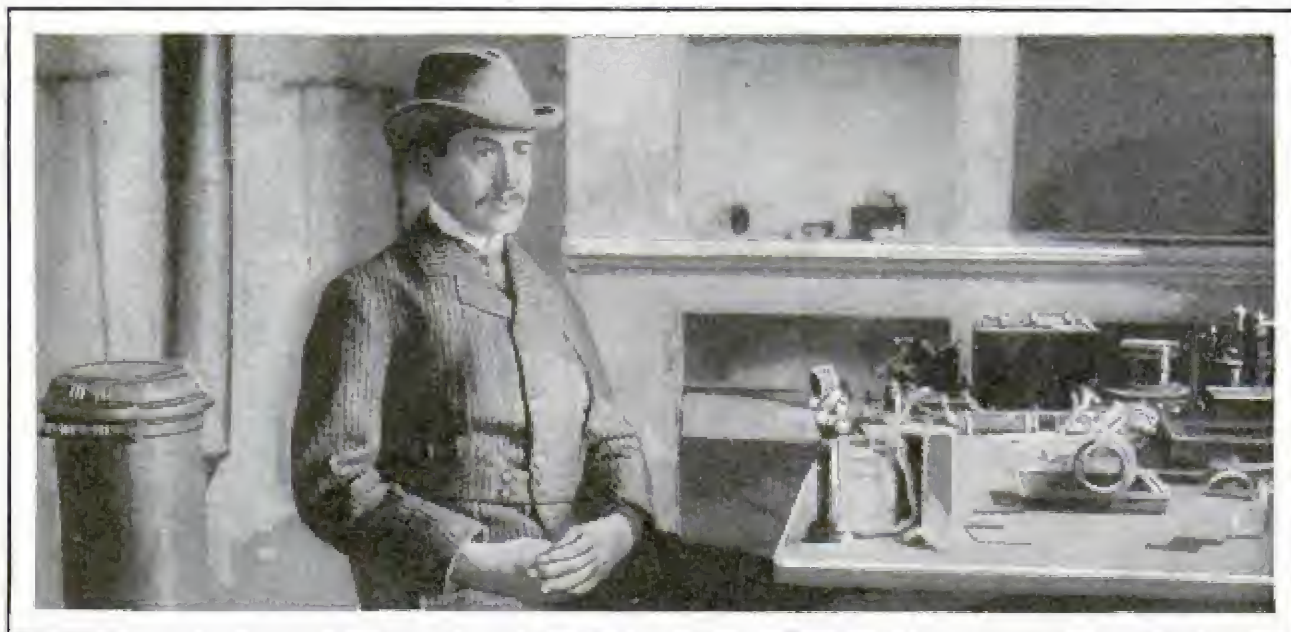
The heliograph was a true "wireless" system, with the drawback that its operation was confined to days when the sun shone. Two adjustable mirrors, mounted on a crossarm fastened to a tripod, were used, the one to reflect the sun's rays on the other, which was aimed in the direction in which the signal was to be sent. Before this mirror another tripod, bearing a shutter operated by a lever, was placed. The lever could be worked like an ordinary telegraph key, sending messages in Morse code by passing dots and dashes of sunlight. In the clear air of the southwest, the system has been used over distances of more than seventy miles.

The pre-electric wireless of ships at sea included not only the international code flags, but semaphore flags which could be used in code combinations corresponding to the telegraph code. At night electric blinker lights on the yard arms of warships flash out Morse code messages to other vessels of the fleet.

But wherever civilization has touched, the wireless, and particularly the new short-wave apparatus, is replacing the older systems.

ELEPHANTS USED AS TEACHERS TO TRAIN OTHERS TO WORK

628 Imported Indian elephants are employed as teachers for their African cousins in a training school for the latter at Api in the Belgian Congo. In the earlier days of the school, which was founded about twenty-five years ago, grown-up animals were taken as pupils, but they were dangerous, difficult to catch and resisted the efforts of the human instructors who sought to train them for useful work. The method now in vogue is to capture the elephants when young and give them educated Indian beasts as individual teachers. Each new scholar is tied by a rope to the leg of its mentor and, willing or not, must follow. In a short time, the pupil learns, by example, how to pull a cart, roll tree trunks and carry burdens. The camp at Api now has forty-two African elephants in training. They not only pay for their schooling by their work but become as good teachers as the Indian animals. The African buffalo is also being trained successfully, and a second school is to be established in the same neighborhood. It is known that the ancient Romans and Carthaginians used to train elephants in warfare, hence it is believed that they must have known how to tame them, but the method seems to have been forgotten for some 2,000 years.

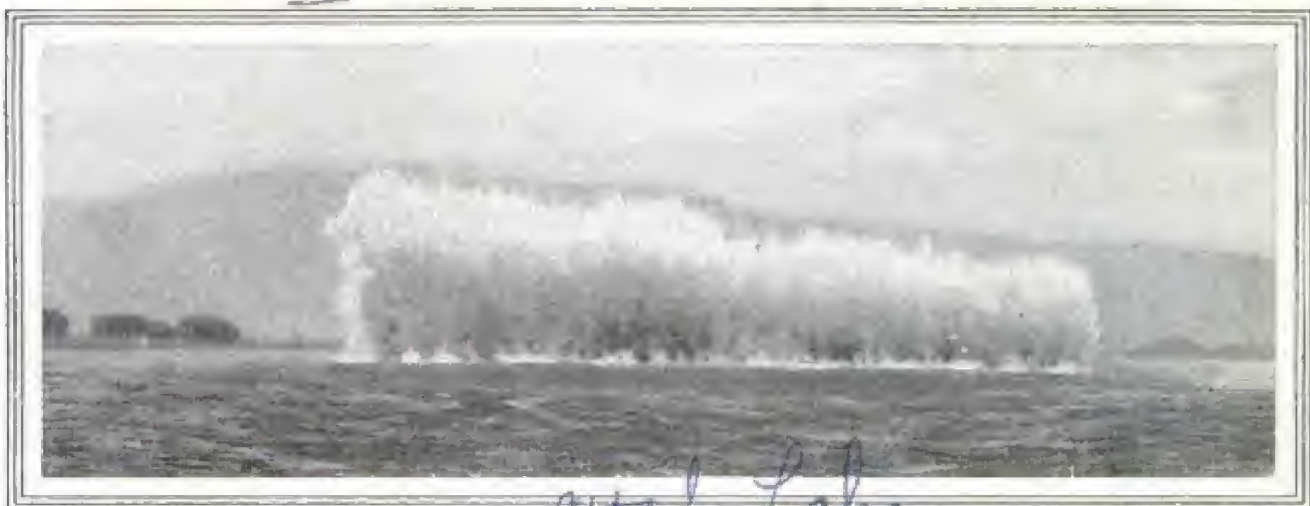


Courtesy The Marconi Co., London

Senator Marconi Sitting before His Instruments in the Cabin on a Newfoundland Hilltop Where He First Heard the Letter "S" Sent through the Ether from His English Broadcasting Station

*Utah Explosives Engineer
from the Esplacines Engineer
by W. J. Koeh.*

DYNAMITE LAKE BOTTOM TO INSURE WATER SUPPLY



Courtesy the Explosives Engineer

Taken an Instant After the Charge Was Fired. Tons of Water and Dirt Thrown into Air as 400 Pounds of Dynamite Were Exploded to Deepen Lake Channel

Utah Lake.

Four hundred pounds of dynamite were used effectively near Salt Lake City, Utah, to deepen a lake channel leading to a pumping plant that supplies irrigation ditches and copper mills near by. The shots were placed under the water in two rows of holes, forty inches apart and about two and one-half feet deep at intervals of eighteen inches. All the sticks were fired simultaneously by electricity. Soundings showed that the blast had cleared a passage about five feet deep and twelve feet wide. The water was from a foot and a half to two feet deep.

the past century, there have been several small eruptions from Mount Rainier.

TILE DESIGNS ON CEMENT TUBS BRIGHTEN PLANT DISPLAY

Patterns in polished, colored tiles have been worked into cement tubs for holding shrubbery by a western firm. The decorations relieve the drab concrete and since the tiles are of scrap and left-over pieces, practically no added expense is involved, save that of arranging the designs. The tubs are heavy and have wide, flat bottoms.

VOLCANOES SILENT FOR AGES NOT ALL DEAD

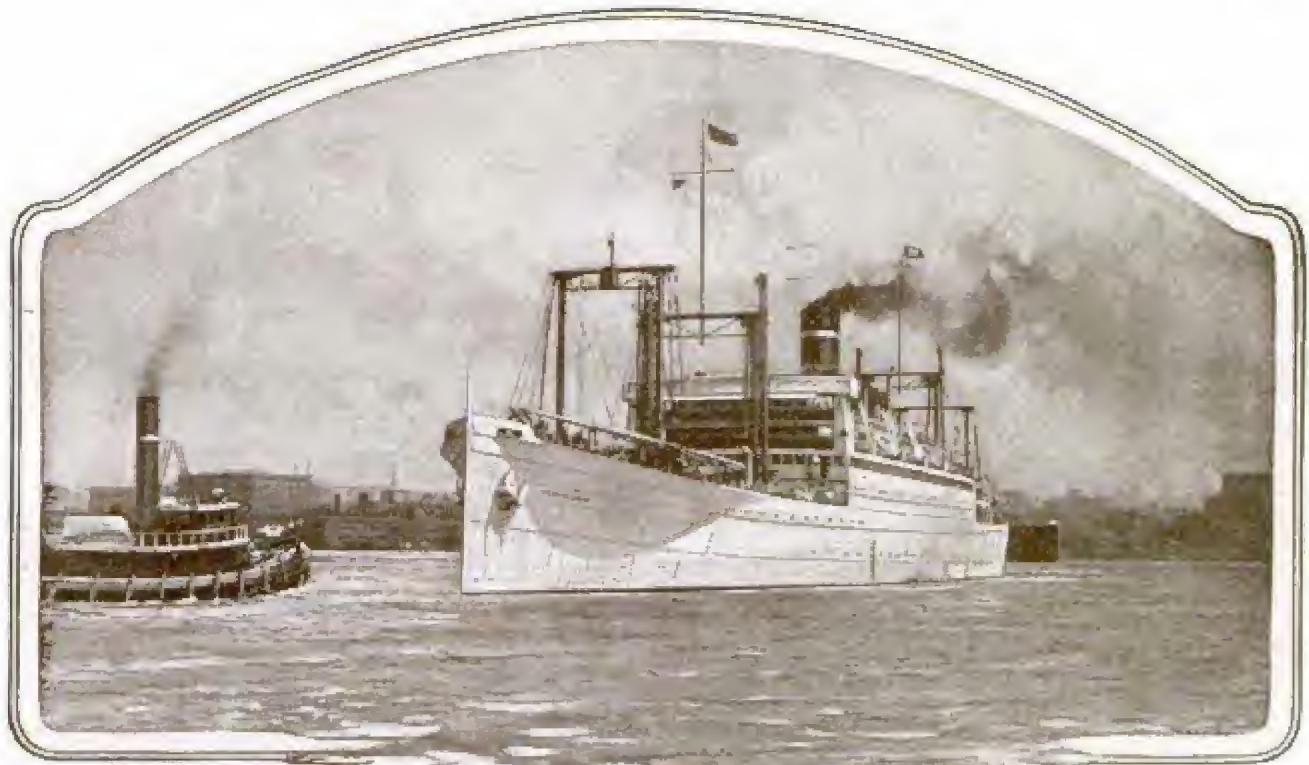
Although the snow-capped volcanic cones on the Pacific coast long have been inactive, not all of them are regarded as scientifically "dead," and some scholars believe that further eruptions from these "sleeping volcanoes" are not impossible. In the northwest, Mount Rainier and Mount Baker, in Washington, and Mount Hood, in Oregon, with Mount Shasta and Lassen peak farther south in California, form a chain of peaks all of which, it is believed, were once in violent eruption. Since 1914, Mount Lassen has been the scene of minor disturbances, and during



Plant Tubs of Cement. Made Attractive by Tile Designs

*Philta Inquirer
10/14/15*

*Used by Metropolitan Building Co. Seattle, Wash.
Cobb Bldg.*



U.S.S. "American Legion" Arriving in New York from South American Ports

South America New Winter Playground

U. S. Liners and Panama Canal Make Continent Mecca for Tourists and Draw American Capital for Development

LURED by summer weather when it is winter in the northern hemisphere, Americans are turning to South America both as a tourist resort and to invest capital in the development of the vast potential resources of that continent. With four government-owned liners, operated by a private company for the United States shipping board, serving the east coast, and the Panama canal bringing the west coast days nearer New York, South American travel has been made as comfortable as going to Europe.

There has always been a close bond of sympathy between the two continents. Simon Bolivar, the liberator of Peru, Ecuador, Bolivia, Colombia and Venezuela, formed his ideas of republican government on a visit to the United States, and after he had driven the Spanish out, the Monroe doctrine made South American independence certain.

Accustomed to think of the frequently revolution-torn republics of Latin America as unimportant nations, most Americans underestimate their size and potentialities. Colombia and Venezuela, the nearest to the United States, are no farther from Florida than Kansas City is from New York, and the first covers as much territory as Texas, California and New York combined, while the second could swallow all of France and Germany. Yet with extraordinary resources of timber, petroleum, metals and agricultural lands, they still are in the infancy of economic development.

Brazil, which occupies just half of South America, is as big as the continental United States, Spain and Italy combined, while Argentina, if set down on North America, would cover all the states east of the Mississippi and part of the first tier west of the river. Chile, on the west coast, is almost as big as California, Oregon and Washington, and Bolivia and Peru are twice as large.

The Panama canal and the fast service of the government ship lines have made it possible to reach Rio de Janeiro in eleven days from New York, go on to Santos, the coffee capital of the world, Montevideo, and Buenos Aires, the Paris of South America, cross the Andes by one of the world's highest railroads, visit Santiago and Valparaiso, sail up the west coast to Antofagasta, Iquique, Arica, Callao, Lima, visiting the ancient Inca ruins on the way, then on to the canal, through it, and back to New York.



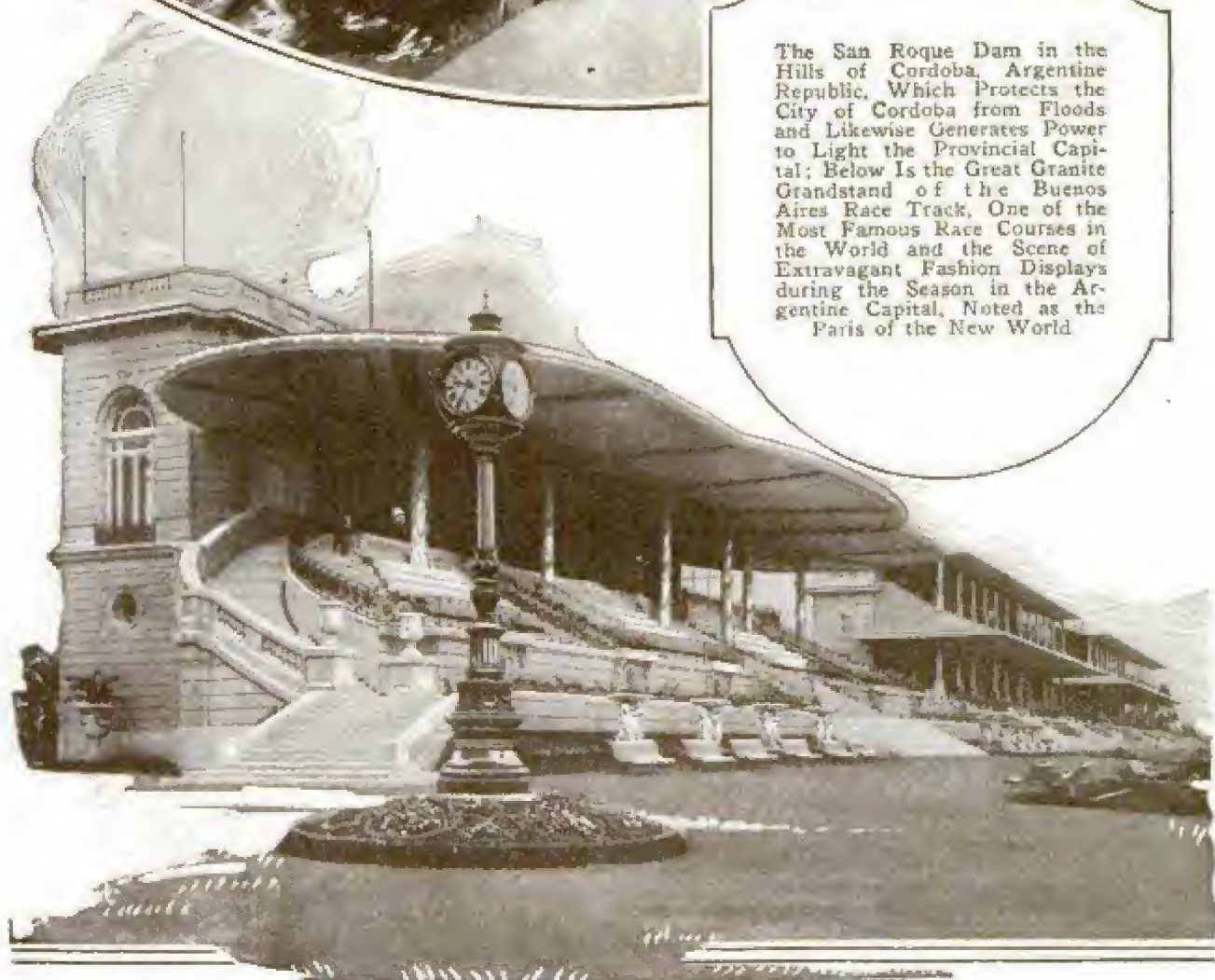
Photos Courtesy
of Pan-American
Line and Pan-Ameri-
can Union

The Magnificent Crescent Harbor of Rio de Janeiro. Above, Dotted with Island Peaks and the Famous Sugar Loaf Mountain in the Background; at Right, the Tomb of Simon Bolivar, "El Libertador" in the Panteon Nacional at Caracas, Venezuela; Bolivar, Who Created More Free Countries Than Any Man in History, Drove the Spaniards from What Is Now Colombia, Bolivia, Ecuador, Peru and Venezuela, and Was at One Time President of Colombia, President for Life of Peru and "Perpetual Protector" of Bolivia, Which Had Been Named in His Honor and Whose Constitution He Wrote; He Obtained His Idea for Freeing His Native Land on a Visit to the United States

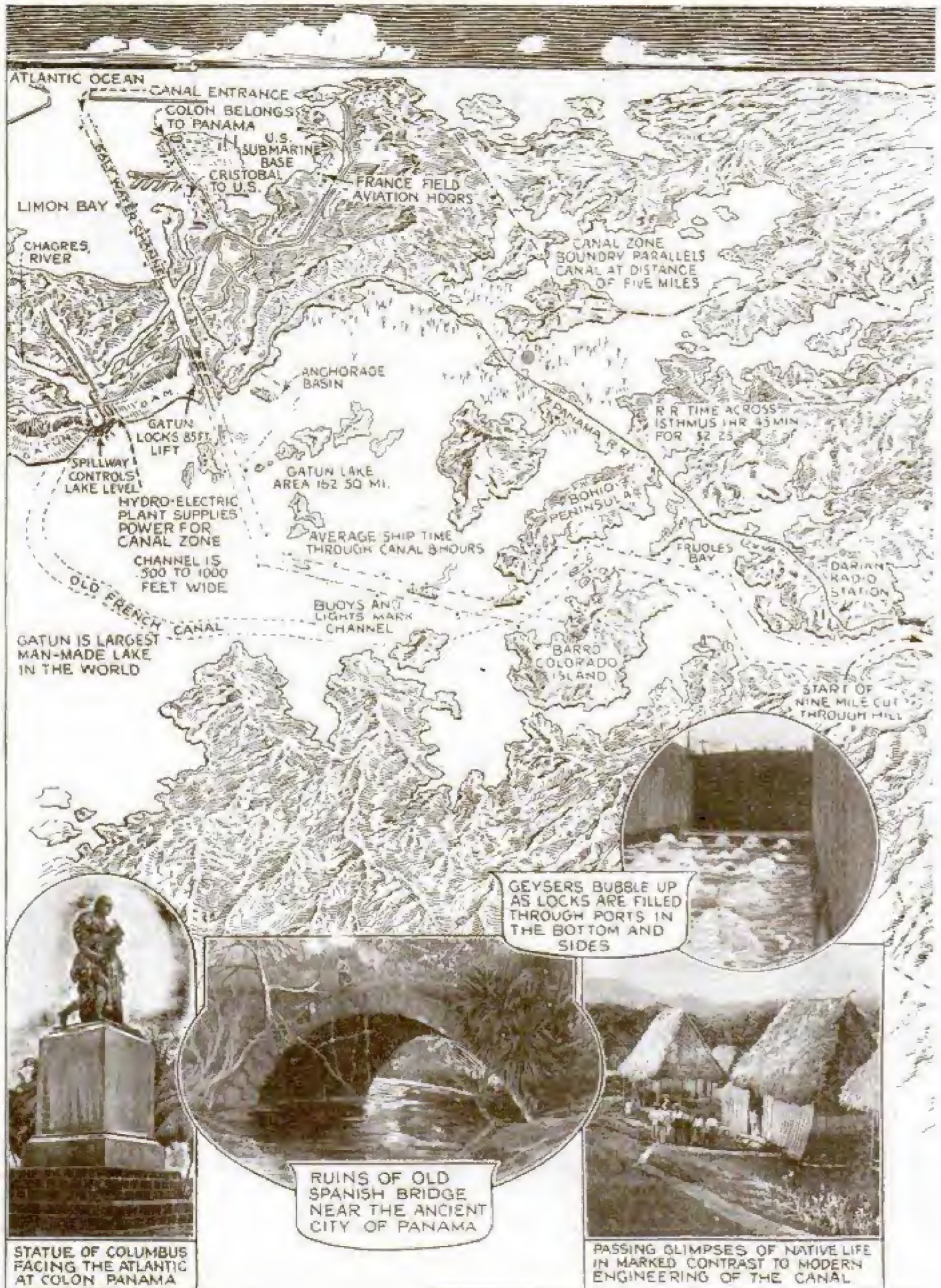




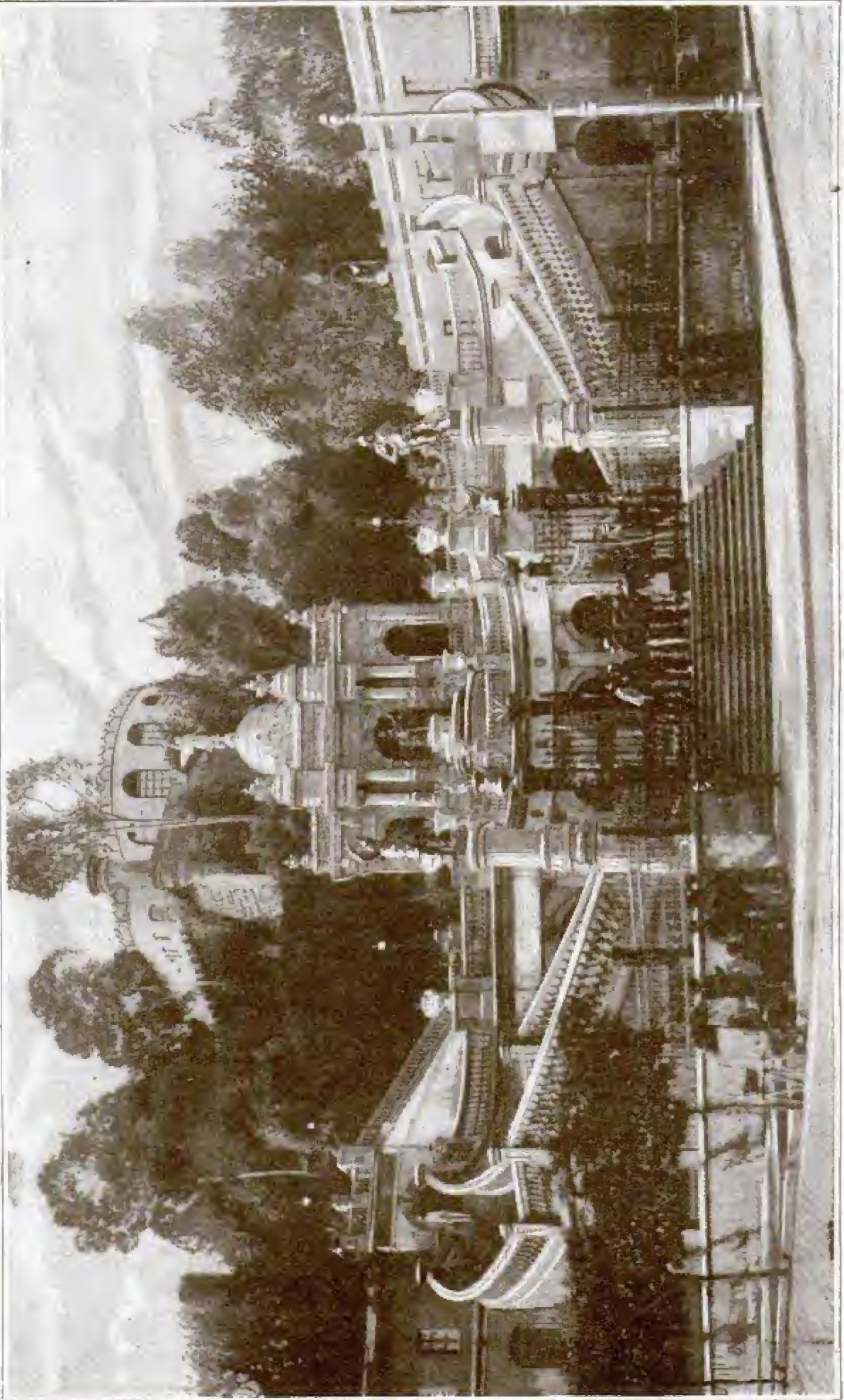
The San Roque Dam in the Hills of Cordoba, Argentine Republic, Which Protects the City of Cordoba from Floods and Likewise Generates Power to Light the Provincial Capital; Below Is the Great Granite Grandstand of the Buenos Aires Race Track, One of the Most Famous Race Courses in the World and the Scene of Extravagant Fashion Displays during the Season in the Argentine Capital, Noted as the Paris of the New World.



Bird's-Eye View of Panama Canal Zone



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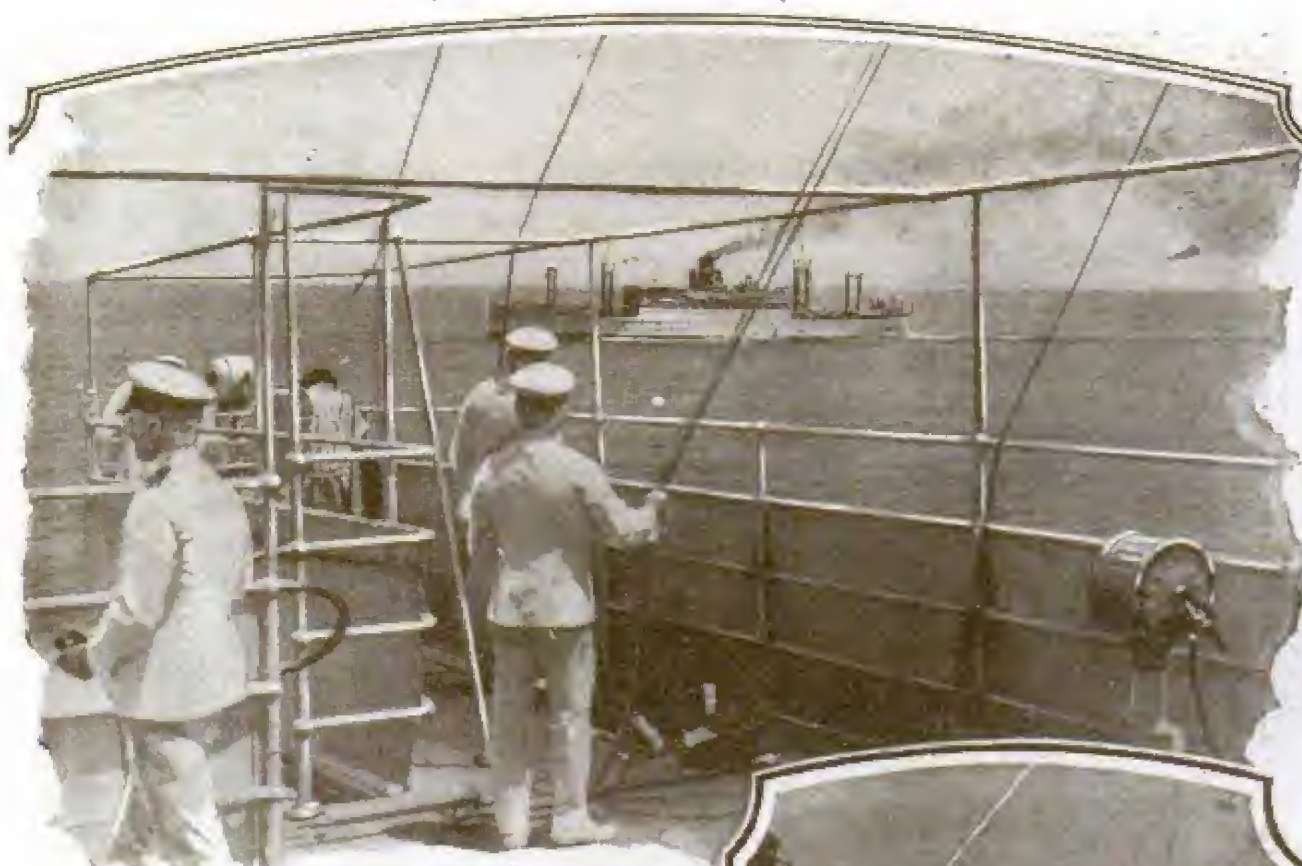
The Famous Hanging Gardens of Santa Lucía Hill Is One of the Noted Show Spots in Santiago, Chile; the Cities of Latin America Are Filled with Magnificent Public Buildings, Statues and Parks, Showing the Effect of Spanish, Italian and French Influences



Every Traveler Crossing the Equator for the First Time Is Called before the Court of King Neptune and Initiated into the Ancient Order of "Freemen of the Seas"; the Sailors Are Lathered with Flour Paste, Shaved with a Wooden Razor and Then Dumped into a Water Tank, but the Passengers Are More Leniently Treated; Even Sand Piles for the Little Tots Are Provided on the Government Owned Ships



504



Two of the Shipping-Board Liners Passing near the Equator, Above, and a Carro of Coffee Being Taken on Board the S.S. "Southern Cross," Plying between New York and the East-Coast Ports of South America



Statue of Simon Bolivar at Caracas, Venezuela; Similar Honor Has Been Paid the Liberator of Five South American Countries by Erecting a Statue of Him in Central Park, New York City



Homes Clinging to the Hills Overlooking the Fishing Boats Drawn Up on the Sands at Old Panama City; at Right, Trans-Andean Train Climbing the Argentine Side of the Range, Bound for the Pacific Slopes



The "Casa Rosada," or Pink House Which Is the Home of the Argentine President

504
42



Jerked Beef Is Prepared and Hides Dried on Open-Air Racks under the Sun in Montevideo, Uruguay; Above Is One of the Large Plants from Which Meat and Hides Are Shipped to All Parts of the World; at Right, an Indian Family in El Gran Chaco, Tropical Territory in Northern Argentina



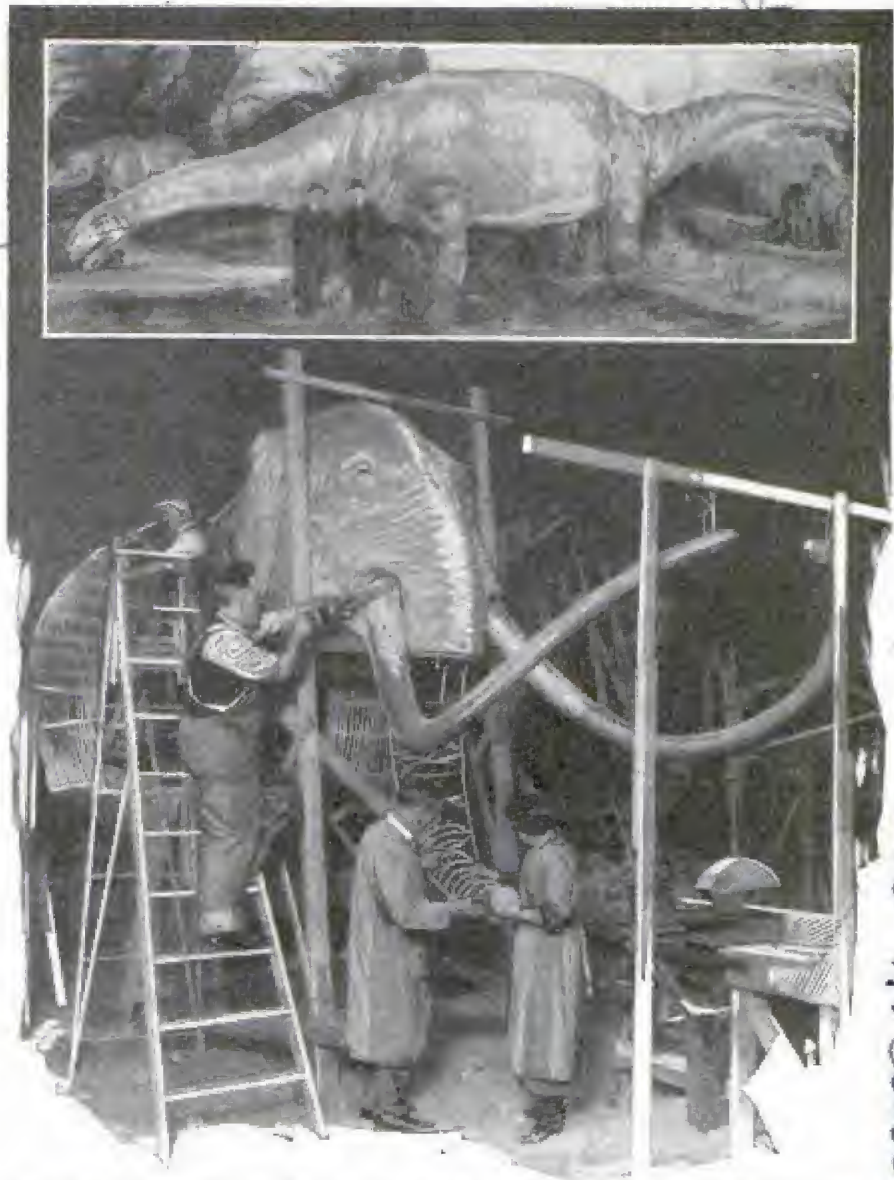
One of the Huge Meat-Packing Plants in Uruguay; Both Native and American Companies Operate in South America

ANCIENT MONSTER LIVES AGAIN IN MOVING MODEL

Equipped with a system of gears operated by motors, a huge moving model of a brontosaurus, a reptile that, scientists say, roamed this continent 10,000,000 years ago, has been built for the American Museum of Natural History in New York City. It is nearly forty-nine feet long and weighs two tons. The body is nine feet high, the head is sixteen feet above the ground when up and the tail fifteen. Both touch the ground when lowered. The neck has five different motions, each leg four, the head three, the tail four and the stomach three. These are obtained by means of speed-reduction gears run by ten motors installed on a table inside the model and controlled from one switchboard, and the motions may be reversed if desired. The body is of rattan, put together with springs to give flexibility. The head and neck are controlled by heavy steel tubing operated through a series of gears and flexible shafts. The covering required 150 yards of heavy quilting with a composition worked over it. The head and feet are made of papier-mache, and the coloring of the animal is executed in green, brown and gray. The monster is modeled after the skeleton of one found in Wyoming some years ago.

TEST TO GAUGE SPEED OF LIGHT WITHIN FINAL MILE

By reflecting beams between two specially constructed mirrors 100 miles apart, Prof. Albert A. Michelson of the University of Chicago, hopes to measure the speed of light to within at least five miles or perhaps even one mile of its actual rate. His tests already have shown that its approximate velocity is 186,300 miles a second. These data were gathered by projecting a powerful light through a mirror



Upper Photo Shows the Completed Model of the Brontosaurus; Below, Workers Are Constructing Flexible Framework for Replica of Mammoth

which was spinning at the rate of about 30,000 revolutions a minute, to a reflecting apparatus twenty-two miles away. The experiments were conducted between Mount Wilson and Mount San Antonio in California. The further tests, planned for this summer, are to be done with more refined instruments. The revolving mirror to be used will have a capacity of three times that of the former. The present estimate of the speed of light is believed to be correct within twenty miles. One of the practical uses of an accurate figure for the velocity is in measuring the distances between points. Knowing the speed of light, it is possible to figure distances with an error of less than one part in a million, an accuracy which no engineering instrument can attain.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

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215 N. Cortis St. Chicago

STADIUM REVEALS SECRETS OF ANCIENT RACE

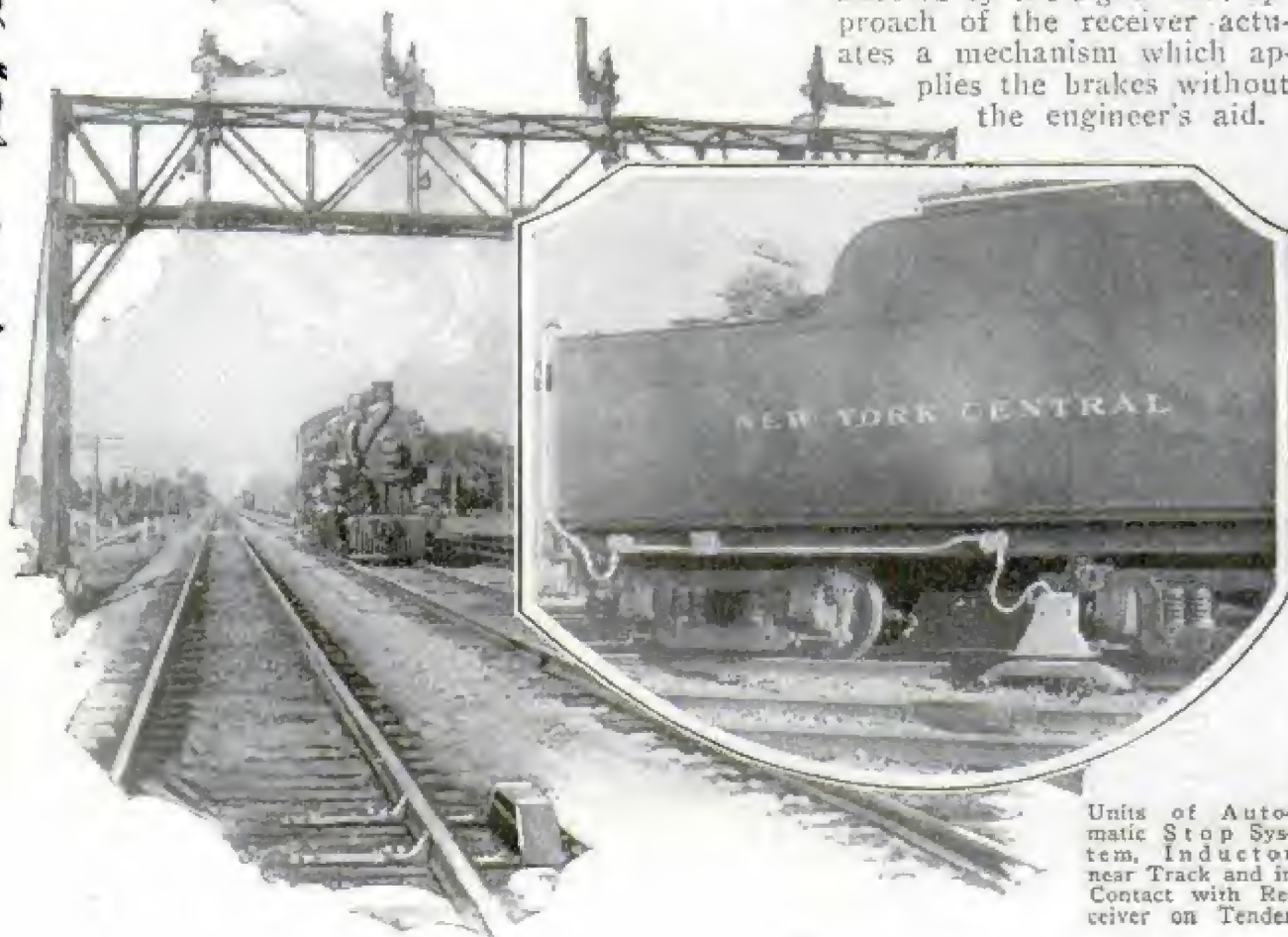
Further wonders of the ancient Maya civilization in Central America have been disclosed by the excavation of a stone citadel, occupying nearly eight acres at Lubaandum in southwestern British Honduras. It is pear-shaped, nearly fifty feet high, and its summit is covered by great terraced pyramids and cement-floored plazas. The northern half of the structure is devoted to an amphitheater, where, it is believed, allegorical dramas were presented to the accompaniment of weird music for the entertainment of as many as 10,000 persons at one time. Banks of seats, similar to those of a stadium, commanded a full view of the central court. The pyramids are flat-topped, unlike those found in other Maya ruins, and show no signs of ever having supported temples or palaces, giving further indication that the

citadel was devoted to a special purpose. Graves were discovered on some of the elevations, containing relics similar to those unearthed in burial places outside the stadium, and the bones, in no case, indicated an age of more than three or four centuries while, in some instances, the burials had occurred less than 100 years ago. Objects found included spears and javelin heads of flint, ax heads, hammers, beads, mirrors of iron, pottery, grinding stones, shell trumpets and whistles. Near the surface of one of the diggings, a figurine showing a man in medieval European dress was picked up, indicating that the manufacture of these articles must have continued after the Spanish conquest, when the Mayas were driven into the forests, killed or forced into slavery by their captors.

ELECTRIC TRAIN-STOP SYSTEM TO PREVENT COLLISIONS

Air brakes are applied automatically and the locomotive must be halted before they can be released by an electric train-stop system now being installed on an

eastern railroad. It consists, roughly, of two main units, an inductor, set in the roadbed close to the track and connected to the block-signal system, and a receiver which is attached to the locomotive tender. In case the block is obstructed or caution is necessary, the inductor is so affected by the signal that approach of the receiver actuates a mechanism which applies the brakes without the engineer's aid.

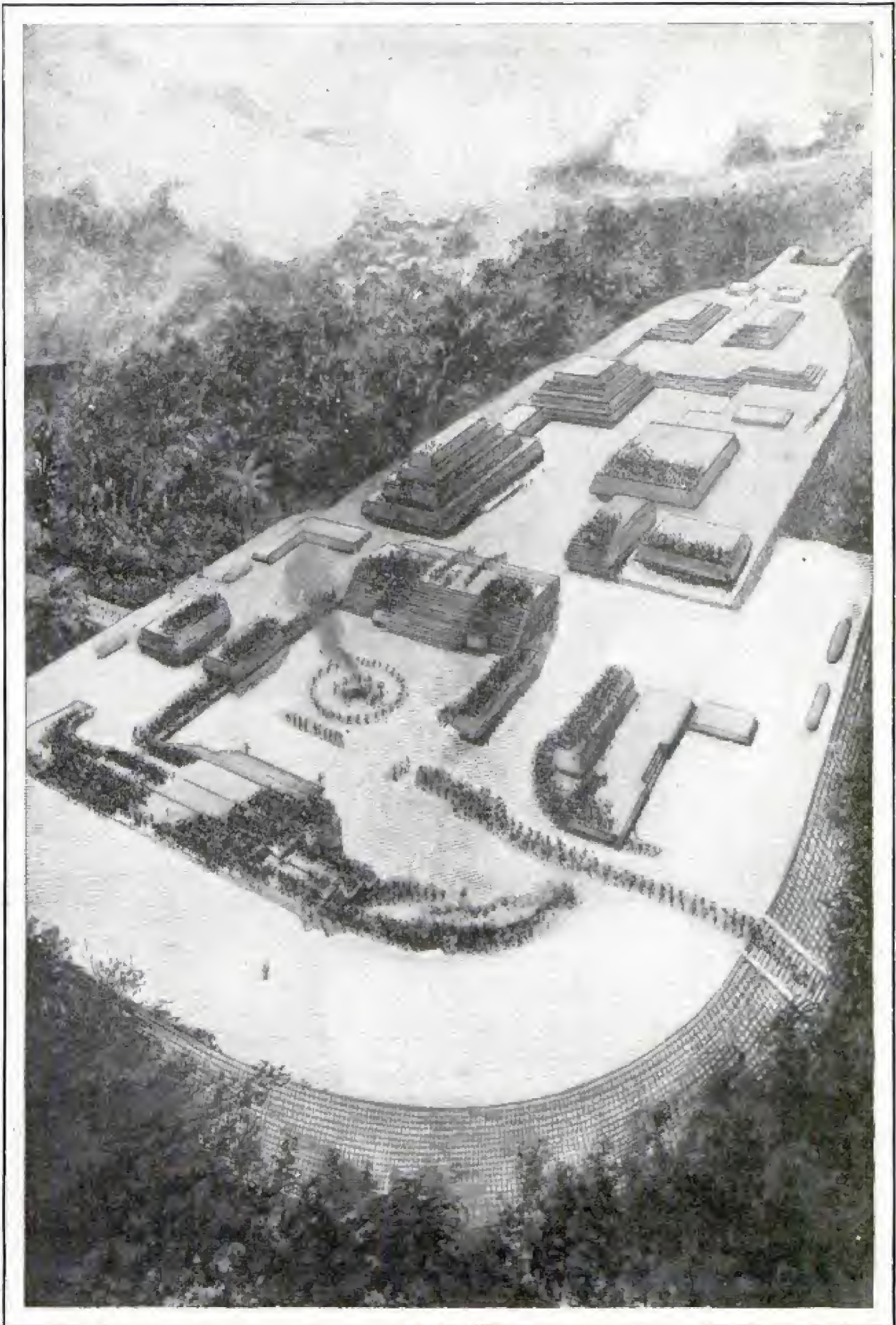


Units of Automatic Stop System, Inductor near Track and in Contact with Receiver on Tender

new York Central R.R. new York
 466 Lexington Ave

638

equipped



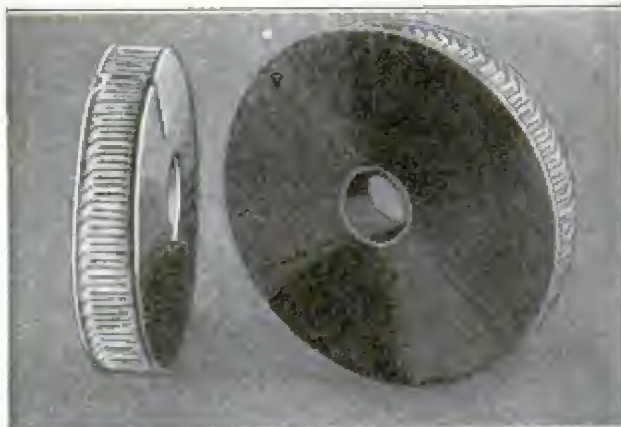
Courtesy Illustrated London News

Largest Prehistoric Building on the American Continent, a Reconstruction Drawing of a Ceremony in a Maya Citadel, the Remains of Which Have Been Cleared from Forest in British Honduras

BARBED BAND ON SPOOL HELPS TO PROTECT GARDEN

502

As a substitute for barbed wire, bands of metal bristling with points are tacked to the top of rails or between the fence



Bands Flat on Spools and Unwound, Showing How Barbs Extend When Strand Is Stretched

posts to protect the yard or garden. The lengths are neatly coiled on spools for convenient handling, and the points are not exposed until the strand is stretched out. The material weighs less than ordinary wire.

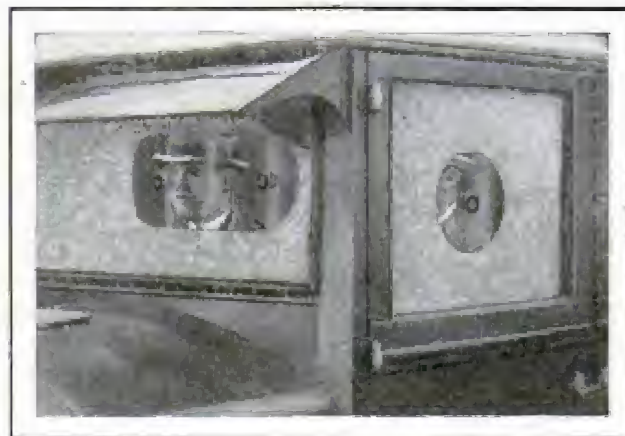
ATTRACTION OF MOON-WEIGHED IN DELICATE BALANCES

Sensitive balances devised by Prof. Ralph C. Hartsough of Columbia university are so delicate that they will react to one 280-billionth part of an ounce. They register the effect produced in a fraction of a second by the changing position of the moon or the attraction which gravitation exerts on an object weighing only one twenty-nine-thousandth part of an ounce. Gold-surfaced mirrors, each a half inch square and held by a beam consisting of a quartz thread as fine as gossamer, correspond to the scales in the balances. The weight is attached to the underside of one of the mirrors. It is constantly being affected by the changing relative positions of the sun, moon and

earth, and is counterbalanced by 150 twists in the quartz thread which exerts a constant pull. Changes in weight are recorded by the shifting of a shadow produced by the displacement of waves of light from a mercury lamp and reflected upon the mirrors. The shadows become narrower or wider according to the relative position of the mirrors. The balances are being used to locate oil deposits. Oil, being lighter than other parts of the earth's crust, causes a decrease in gravitation. Surveys are made over an area at 1,000-foot intervals. Wherever the scales show a relatively slighter attraction, a test boring is made for oil. The instrument also provides a test for the validity of the Einstein theory, which holds that impulses of gravitation have the same speed as light. If this is true, the moon should exert its pull one and one-third seconds after it passes a given spot, the time it takes light to get to the earth from the satellite. The scales are adjusted to measure any changes in gravitation that take place in a fifth of a second because of the moon. Because of the vibrations due to street cars and other traffic, delicate tests such as this cannot be made except in secluded spots. The scales are said to be 100 times more sensitive than the most delicate instrument known before their invention. They weigh fifteen pounds and although they must be protected from changes in temperature, are fairly sturdy.

VISION SHIELD FOR AUTO GLASS PREVENTS FORMING OF FROST

Held to the automobile window by rubber vacuum cups, a strip of transparent material now on the market, keeps frost or mist from forming on the glass. It is easily removed or attached, can be cut in neat shapes and is said to be effective even in the coldest weather.



Peepholes through the Frost; How the Shields on Auto Glass Aid the Driver

Hedeen Co. Minn.



© Henry Miller

This Man Is Paid to Nick Dishes. The Weight Is Drawn Back, Then Allowed to Strike against Plate; the Force of the Blow Is Indicated on Dial

Saving Our Dishes from Breaking

Government Scientists Shatter Cups and Saucers to Test
Strength and Durability of Crockery

By UTHAI VINCENT WILCOX

DID you ever drop a dish and it failed to bounce—just went to pieces before your eyes? Did you ever nick the best plate or the favorite tea cup? Did you ever have one of your dishes accidentally fall to the hard, unyielding tile floor at the soda fountain—and everyone craned to look your way? If any of these experiences were ever yours, you have fervently wished that some one would invent some unbreakable crockery. "Oh, if only china could stand a little hard usage," you moan.

But think of the hotel managers and the restaurant keepers! They, too, would like to have some of the unbreakable kind of crockery. Yes, indeed they would, when they pay untold thousands of dollars a year because dishes will break. It is a fact that one eastern hostelry of international repute spends more than \$60,000 annually for new dishes and glassware to replace those broken in handling. A leading Chicago hotel has to count in the

budget \$35,000 to replace chinaware alone. Restaurant keepers regularly charge for a twenty-per-cent dish breakage each year. And that charge must be paid for by the patron of the restaurant, hotel, and eating house where crockery is used.

So, breaking dishes becomes something of a national problem touching the pocketbook of every man and the budget of every housewife. If it were possible to tabulate the dish-breakage losses throughout the United States, the total would look like interest on what Europe still owes us. Everytime we eat in a restaurant, or a hotel, or at home we share in the sum total. But cheer up. This is to bring you good news and not to add to your resentment at the high cost of living. It is a fact, thanks to a group of scientists who labor for us at the bureau of standards, that dishes are now growing up—they get older in service and stand harder knocks without collapsing. These scientists have made machines that subject the dishes

3/9-10th St.
N.W.
Washington
D.C.

to the same usage that you do or the amateur or professional dishwasher and waiter. They have just stopped short of using heavy artillery and high explosives. All of which, incidentally, gives a conception of rough usage that science gives to crockery with the expectation of helping users and manufacturers to obtain cups, saucers, and plates, and all the rest, that will not break except the heavens fall.

One dish-breaking outfit made by Uncle Sam's men consists of a heavy weight against which the plate is held. The investigator-of-the-truth-about-dishes draws back a steel ball attached to a pendulum arm, letting it fall against the plate. If the plate doesn't break with the first hit, he tries it again and again, all the time increasing the distance that the steel ball has to travel as measured off on a graduated scale.

The strength figures indicated on the scale are noted down, and as the plates break at this figure or at that, it all goes into the record. The plate that can stand the most is the plate that wins, and by such a process are better plates made. The same steel shot is also used on the plates to find out how much they will stand before nicking. It's something like hitting the faucet over the sink with the plates, cups and saucers when washing the

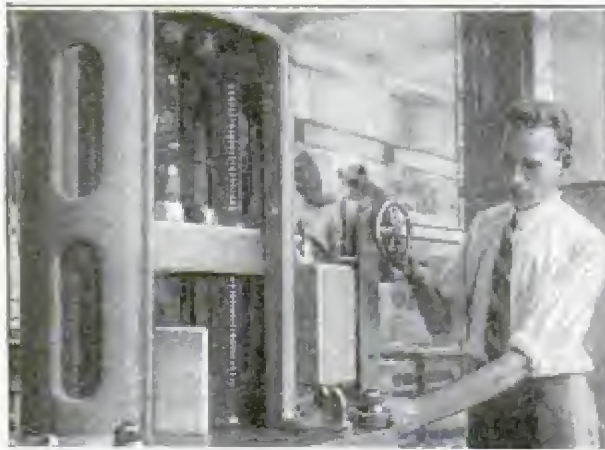
of them stand it. According to these scientists, the tumblers and glasses that stand such treatment have strength enough to survive a four-foot drop to a concrete floor.

Other tests include sudden heat and cold. Extremes of each are given to simulate conditions to which these culinary articles are subjected in the commercial restaurants or hotels where mechanical dish-washing machines play havoc. Boiling tests are given to glassware in order to find the kind that will endure the most.

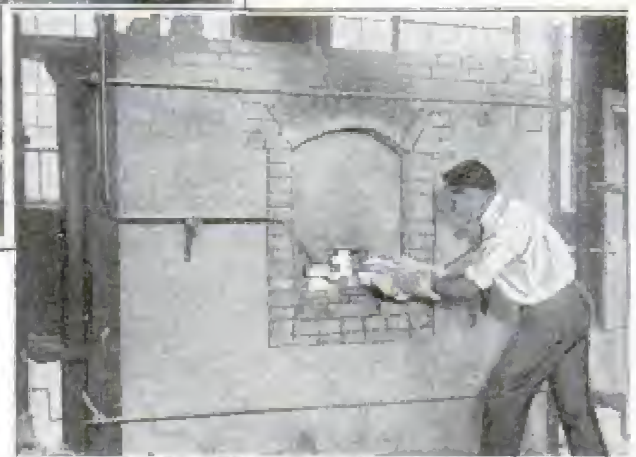
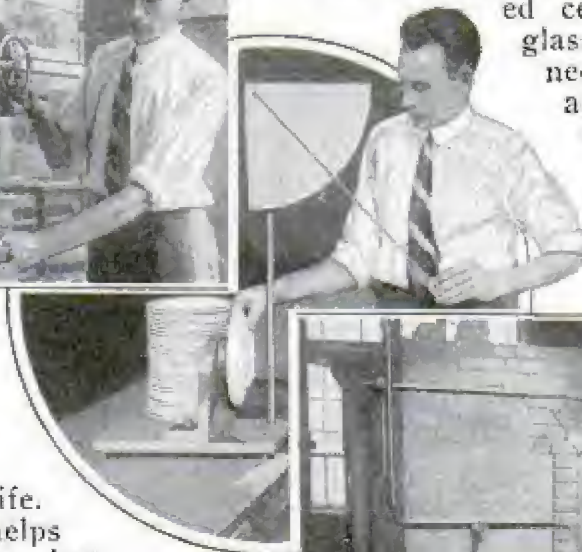
But the dishes that grace the dining table are not the only victims of this pounding and hammering and sliding and chipping and dropping and heating—window glass comes in for its share. How much will your window pane stand if Dick bats his ball against it? This may not be the way the problem is stated in the scientific papers of the bureau, but that is what it amounts to. How much storm pressure will your window stand on a wild, gusty night when the whole house shivers in the blast and the thunder reverberates even beneath the blankets?

In the government laboratory wind pressure is simulated by water pressure, which is so regulated that it duplicates the vagaries of the wind. Hammers and steel balls test for the sudden breakage as when the rock goes astray from the urchin's hand.

To do this, a piece of the window glass is placed on the testing machine lying flat. A saddle is suspended over the unsupported central portion of the glass. This saddle is connected with a swinging arm similar to the ordinary scale arm. A standardized bucket is placed on the far end of this arm so that it will catch all



From Top to Bottom. Rack That Exerts 100,000 Pounds' Pressure on Dish; Another View of the Breaker in Use and Kiln for Heat and Cracking Tests



dishes for Friend Wife.

The tumbler tester helps the alibi—"the bottom just dropped out; honestly it did!" The glass is placed so that its bottom is exposed. The iron ball attached to the pendulum is then drawn back the graduated distances and released. The weight rams into the bottom of the glass. And some

the shot that flow from an adjoining shot tower when the gate is opened. The shot pouring on the bucket that rests on the scale beam, which, in turn, is fastened to the saddle, exert a constantly increasing strain on the glass. At last, when this machine has poured out more shot than the glass can stand, it breaks, and in so doing pulls a trigger that stops the flow of shot. The weight of the shot in the bucket gives the transverse strength of the glass.

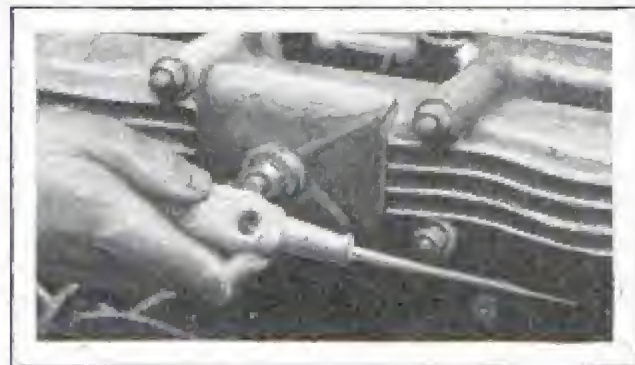
These and other tests are studied intensively by architects and engineers, and as a result, your house, your store, your office windows are made to withstand the necessary strain.

Such tests by cold and calculating science have established one fact that is interesting to buyers of crockery, glass and china, and that is that the made-in-America ware has come through with better marks than the imported dishes. These demon dish destroyers have found that, as a rule, the homespun plates, cups and saucers are more durable than the best of the foreign brands.

American hotels have been interested, because it will save a large bill of lading from European sources, which in turn will make cheaper eating.

SCREWDRIVER FOR AUTO KIT TESTS SPARK PLUGS

A tester for spark plugs and a screwdriver have been combined in one useful implement for the auto tool case. In trying the plugs, the flash, if visible at all, is



Opening in Side of Screwdriver Exposes Visible Flash in Making Spark-Plug Tests

seen through an opening in the side of the handle, which is so arranged that the user is protected from shocks likely to be suffered if he were working with an ordinary screwdriver.

According to estimates, about one per cent of the bituminous and twenty-five per cent of the anthracite-coal resources of this country have been mined.

LEVER SHEARS TO CUT STEEL REDUCE WORK AND COST

Steel sheets or bars up to a quarter of an inch in thickness are cut smoothly or slit with little difficulty in lever shears a

Metal Shears in Operation: Slight Pull Exerts Great Leverage on Blade



western inventor has patented. The jaws are so hinged that the blades do not get out of alignment, assuring clean, straight edges both in cutting and in slitting. Great leverage is applied from the handle with but a slight pull.

LENGTH OF LIFE IS INCREASED TWENTY-ONE YEARS

Largely through the aid of efficient hospitals, the average length of human life in this country has been increased twenty-one years in the past generation, according to a Chicago physician. He predicts that another twenty-one years will be added in the next half century so that it will be "unnecessary if not negligent for anyone to die before he is seventy-five years of age." One of the aims of the American Hospital association is to provide homes for patients who are recovering so that beds will be available in the hospitals for acute cases. Grading of nurse education is also being developed as one of the institution's most important activities, and it is said that the hospitals of America have more young women students than the universities and colleges.

Mr. E. S. Silmore

Acme Products Co., Perham, Pa.

443 S. San Pedro, Los Angeles, Calif.

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Letter rec'd 12/1 7/25

Louisville, Ky.

Before American Hospital Association Annual Convention

GLASSES IN LIGHTHOUSE LENS
OF THIRTY DIFFERENT SHAPES

Capable of intensifying light more than 1,000,000 times, the lens for one of Uncle Sam's light houses on the Atlantic coast contains



Polishing the Huge Glass Lighthouse Lens; Pieces Are Set to Intensify and Focus the Rays

glasses of thirty different shapes. They are so arranged that the beams are reflected and focused so efficiently that radiance from the oil lamp, which is the light source, is visible for several miles.

PERIL OF ARCTIC TRIPS SHOWN
IN BIG TOLL OF SHIPS

The successful return of MacMillan and Amundsen from their latest expeditions to the north, recalls that many earlier explorers gave their lives to Arctic adventure and that a long line of sturdy ships has surrendered to the ice. Less than two years ago, William Nutting and three companions set out from Norway to follow the Viking trail to America in their little ship, the "Leif Erickson." They disappeared after leaving the coast of Greenland. Earlier centuries had their Arctic expeditions. In 1500, Gaspar Corteal, a Portuguese explorer, ventured in-

to Hudson strait in a small craft and was never heard from again. His brother and a number of companions who organized a searching expedition, likewise were lost. Four hundred years before there was a map of the Arctic, Sir Hugh Willoughby sailed into the north, later to be found dead with his crew and the ship frozen fast in the ice. Sir Martin Frobisher's search for the northwest passage in 1590 met with partial disaster when one of his three ships foundered in a gale. Bering made many expeditions during the middle part of the eighteenth century, but was finally wrecked on the island that now bears his name, and died, there, legend says, of a broken heart. After a successful voyage into northern seas with Peary, in 1893, and a relief expedition a year later, the "Falcon," commanded by Capt. Henry Bartlett, a skilled navigator, was lost with all her crew. The first "mariner of the air" to be claimed by the Arctic was Salomon August Andree, who, with two companions, left Spitzbergen in 1897 in a balloon fitted with sails and trailing ropes. They hoped to reach the pole and return, but a few of the buoys dropped from the basket as a means of tracing the expedition and a message brought by a carrier pigeon, were all that came back of the ill-fated venture. In May, 1845, Sir John Franklin, with 129 men and the "Erebus" and the "Terror," set out to find a northwest passage. Neither the ships nor any of the men returned. Thirty relief expeditions, over as many years, were sent in search of them, although a message found fourteen years after the men had sailed, stated that the ships had been crushed in the ice.

WEDGE-SHAPED AIR CUSHION
ADDS TO AUTO COMFORT



Motor drivers are spared fatigue on long journeys by using an inflated, wedge-shaped cushion that may be adapted as a seat, as a back rest or as a buffer or pillow for the head, neck and shoulders. It also places a short person nearer the steering wheel. It is made of a rubberized material in various colors, and when deflated occupies but little space. Blown up, it is sixteen and one-half by eighteen inches.

Kansas City Times

Airrubber Corp.



The Air-Mail Pilot's Headphones Are Built Right into His Helmet, So That When He Puts It On, He Is Ready to Tune In on the Radio Receiver in the Corner of the Cockpit

Aeronautics Radio to Banish Chief Danger in Flying

Air-Mail Experimental Laboratory Perfecting Wireless Guiding Beacon and Altitude Finder to Protect Flyers in Fogs

IN a tiny shack hardly twelve feet square, set down at the edge of a cornfield on the Illinois prairie a few miles from the Mississippi river, two revolutionary inventions are being perfected to remove the worst dangers which confront airmen.

One of the devices is a radio beacon, or compass, which will enable a pilot to fly straight from one point to another through the thickest fog or the darkest night. The other is a radio altitude finder, or altimeter, which will keep him at a safe height above the ground, free from the danger of crashing through fog or darkness into some mountainside.

The prairie laboratory is the experimental field of the United States air-mail service. On one side of the rutted country road, in a small clearing reclaimed from the surrounding cornfields, is the tiny experimental laboratory and the tall wooden lattice masts of the radio department. Across the way, at the edge of a meadow big enough for a plane to land and start, are a two-ship hangar, offices and shop. The place, at the edge of Monmouth, is many miles south of the trans-continental air-mail route, so that work can be carried on without any interruption from the planes that day and night

flash through the sky. In this out of the way spot, southwest of Chicago, most of the development work for the air mail is carried on. A measured test course stretches away to the south for the testing of new planes, both those built in the air-mail shops at Maywood field, Chicago, and new designs submitted by manufacturers. Three new types were tested a few months ago and models picked to replace the DeHavillands, which have been standard since the service started. In the radio laboratory, however, the most work is being done. The wireless beacon, originated by the bureau of standards, improved by the army signal and aviation sections at McCook field, is being perfected for standard air-mail and commercial flying. Like the beacon lights which stretch from New York to the Rockies along the night-mail routes, the radio apparatus of the air-mail service will be at the disposal of every commercial flyer, as well as mail or service pilots.

The radio beacon has already been tested successfully over distances of more than 200 miles on long wavelengths, well above the usual commercial range, and tests are now being made on sixty meters, with the idea that the shorter waves will



not only eliminate much of the static interference, but, by using less power, will make the stations cheaper to build.

Photo-Diagram of How the Radio Beacon Works: the Code Signals Sent Out on Each of the Triangular Aerials Interlock in One Zone to Form a Continuous Guiding Signal

With the present equipment, each station would cost about \$6,000, and it would take some fifteen or sixteen to span the continent on the New York-San Francisco mail route alone. The altitude finder, based on apparatus designed for the air mail by C. Francis Jenkins, inventor of the radio movies and a process for transmitting photographs by wireless, is still in the experimental stage, but already shows promise of success.

In addition to its other work, the experimental division also is testing the Jenkins picture transmitter with the idea of handling the air-mail orders between stations by sending a facsimile of the written sheet instead of trusting to the dots and dashes of wireless code. Eventually the picture system may be available to mail patrons as an additional way of transmitting a letter, faster by far than either train or airplane. In six minutes an exact facsimile of a letter, signature and all, could be transmitted from coast to coast

and then delivered by special messenger. The service, it is believed, would be specially useful to banks and lawyers, as it would be proof of genuineness, a point that is not true of telegrams.

The idea of a radio beacon to guide airplanes from point to point originated in Germany as far back as 1907, and was used with varying success to direct the Zeppelins in their raids on London, but

in its present form it is purely an American development. It is based on the fact, which every owner of a radio-receiving loop has learned, that the loop antenna has a directional effect and receives its strongest signals when pointed straight toward the transmitting station, while, when turned at right angles to the sending point, it fails to pick up the broadcast at all.

The same properties of receiving loops hold good when the sending station uses an antenna of this form, but in the radio beacon the air mail uses not one loop but two. They are of triangular shape, supported from a single wooden mast about seventy feet high, with the base wire eight feet above the ground, and 250 feet long.

The two loops are erected at right angles to each other. An automatic sending device transmits the letter "N," a dash and a dot in wireless code, on one loop, and sends out the letter "A," a dot and a dash, or just the reverse, on the other loop. An aviator with a receiving set, if he were in line with either loop, would receive only the signal transmitted by it, but halfway between the two, he would pick up both signals with equal intensity, while on either side of the halfway point, the farthest signal would gradually fade away, while that from the nearer loop grew stronger as he approached it.

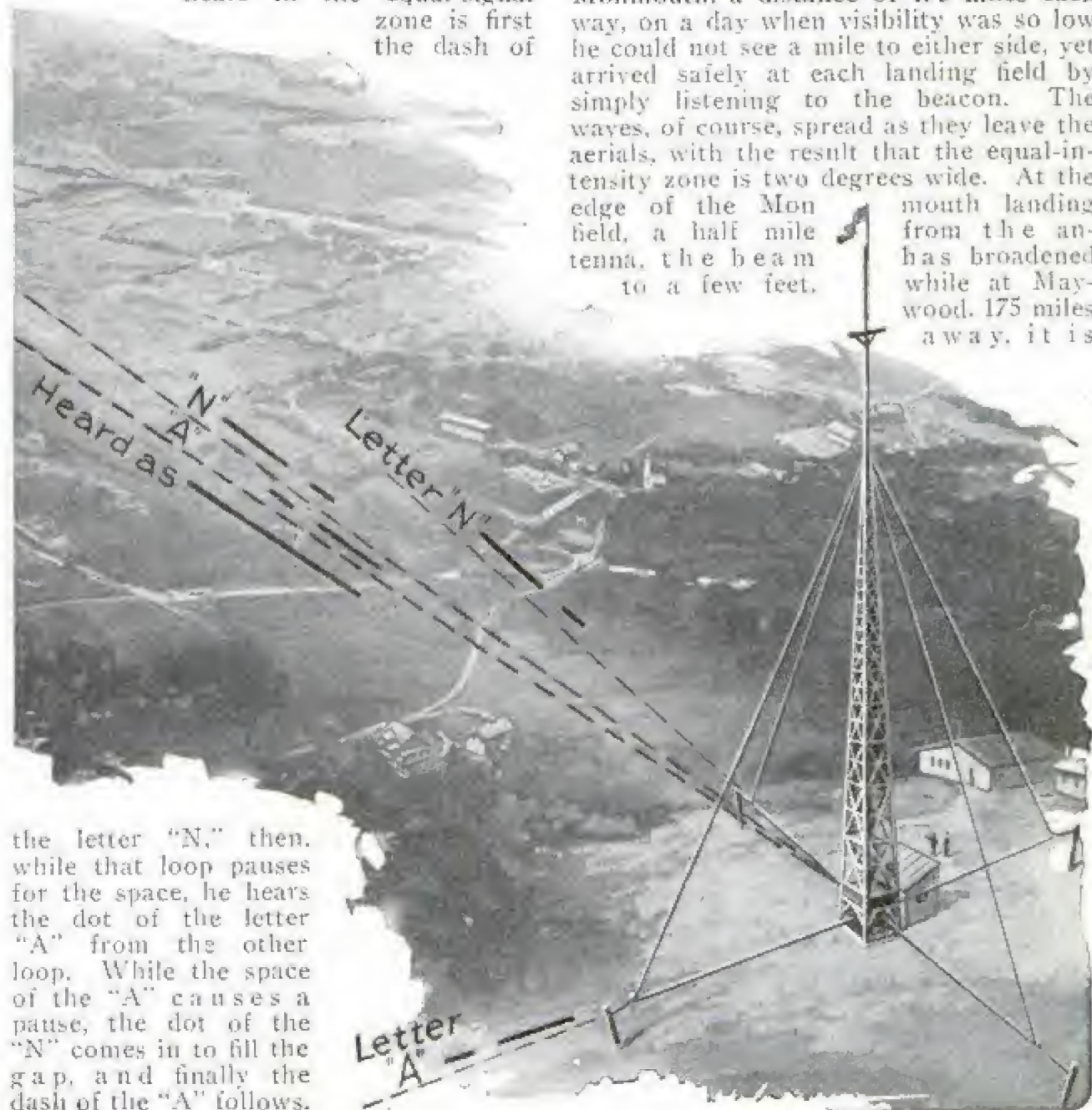
The sending arrangement is such that when the flyer is in the equal-intensity zone, the two signals interlock. A wireless dash is twice as long as a dot, and a space equals a dot. What the aviator hears in the equal-signal zone is first the dash of

The interlock of the signals, however, turns all that into one long dash, a considerably magnified letter "T."

As long as the pilot, at five-second intervals, hears a steady "zzzzzzzzzzzz" in his phones, he knows he is right in the wireless beam and on his true course. But if that steady sound breaks up into separate signals, one half loud and the other faint, he is off to one side. If he is to the right, while flying toward the Monmouth beacon, there will be a loud "zzzz" for the dash of the "N," then a fainter "zz" as the dot of the "A" comes in, followed by a loud "zz" and a fainter "zzzz." If he is to the left of his course the signals will be reversed, the first faint, the second loud, and so on.

Pilot Burnside, of the test division, made a round trip from Maywood to Monmouth, a distance of 175 miles each way, on a day when visibility was so low he could not see a mile to either side, yet arrived safely at each landing field by simply listening to the beacon. The waves, of course, spread as they leave the aerials, with the result that the equal-intensity zone is two degrees wide. At the edge of the Monmouth landing field, a half mile from the antenna, the beam to a few feet.

mouth landing from the antenna, the beam has broadened while at Maywood, 175 miles away, it is



the letter "N," then, while that loop pauses for the space, he hears the dot of the letter "A" from the other loop. While the space of the "A" causes a pause, the dot of the "N" comes in to fill the gap, and finally the dash of the "A" follows.



about five miles wide, hence easily located by a pilot flying toward that field.

While, if both aerals contain exactly the same amount of wire of the same resistance and the same amount of current is used to send the signals in each, the equal-signal zone will be halfway between them, the zone can be changed at will by increasing the current in either aerial. No three of the air-mail fields are in a direct line, and after a pilot has flown from one to another in one beacon zone, it is necessary

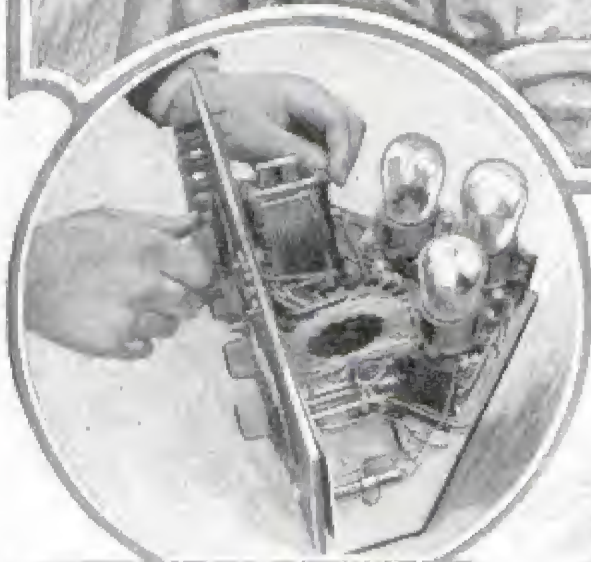
Radio Altitude Receiver and Sender and How Signal Reflected from Earth Lights Lamp at Certain Height

to shift the beacon to guide him on to the third. The shift is accomplished accurately with a device called a goniometer, which can be set instantly for any point on the compass after it is once calibrated.

The transmitting set used is a standard radio telephone, so that the operator in charge can cut in at any time to transmit weather reports, orders or other information to the pilots. At present, the pilot will have no way of talking back, but a light sending set to be carried in the planes is also be-



An Air-Mail Plane Cockpit, Showing the Corner Receiving Set, Where It Does Not Obstruct the Instrument Board, and, Right, the Aerial Reel, Both Out of the Way of the "Joystick" in the Pilot's Hand



The Beacon Receiver Is Built Triangular to Fit in the Corner of Cockpit, Giving Unusual Grouping of the Tubes



With the Goniometer, at the Left, It Is Possible to Direct the Radio Beacon to Any Point Desired by Merely Shifting the Revolving Pointer; the Queer Apparatus in the Foreground, Driven by the Small Motor, Carries Notched Disks Which Automatically Send Out at Five-Second Intervals the Dots and Dashes Which Interlock to Guide the Plane; Above Is a Big Rectifier, Which Changes Alternating Current to Direct Current



ing developed at Monmouth. The radio altitude finder, being developed on the Jenkins idea, is even simpler than the beacon. It consists of a very small transmitting set, using only two ordinary radio-receiving tubes, and a small three-tube receiver. The pilot has only to turn on the sending current, which transmits an electrical wave to the ground, from which it is reflected back to the plane. A sensitive instrument on the receiving-set panel will measure the strength of the return signal, but instead of being calibrated in milliamperes, the instrument dial will show feet, since the strength of the returning signal will vary in accordance with the height of the airplane above the earth. The scale will read backward, the higher the plane flies the weaker the current returning.

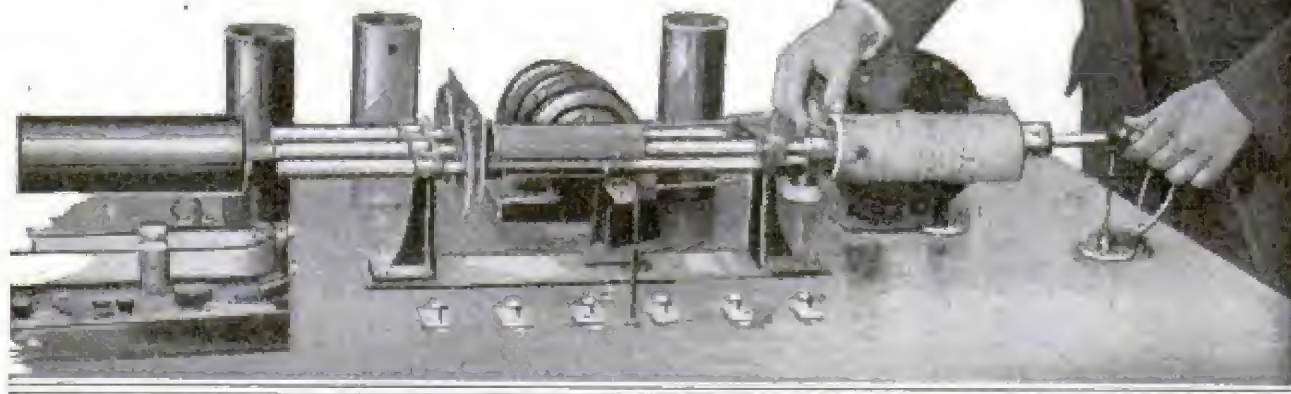
Experiments are also being made in using a tiny electric-light globe filled with neon gas to give a visible signal. With it, the receiving apparatus will be set for any desired height above the ground at which the pilot wishes to fly. When the plane reaches that altitude, the light will come on, and remain on so long as he keeps his height. If the plane passes over a hill the light will go out, and the same will be true when a valley is reached. The wireless wave sent out from the ship does not follow a straight line to the ground, but describes a letter "S," and coming back, travels a reversed S-route, so that the two waves together form a figure "8." With the receiving apparatus set for a certain altitude, the two S-shaped curves will meet at that point, and be in phase, lighting the lamp. As they will not meet in phase at any other point, it follows that the light will glow only when the pilot is flying at his predetermined level.

The signal corps and air service at McCook field are developing a similar light arrangement for use in the radio beacon, giving a visible check on what the

pilot hears in his phones. Three small lights will be used, red, green and white. If the plane strays to the left of its course, the red light will burn; if to the right, the green will come on, while when the ship is in the interlocking beacon course, the white light will record the fact.

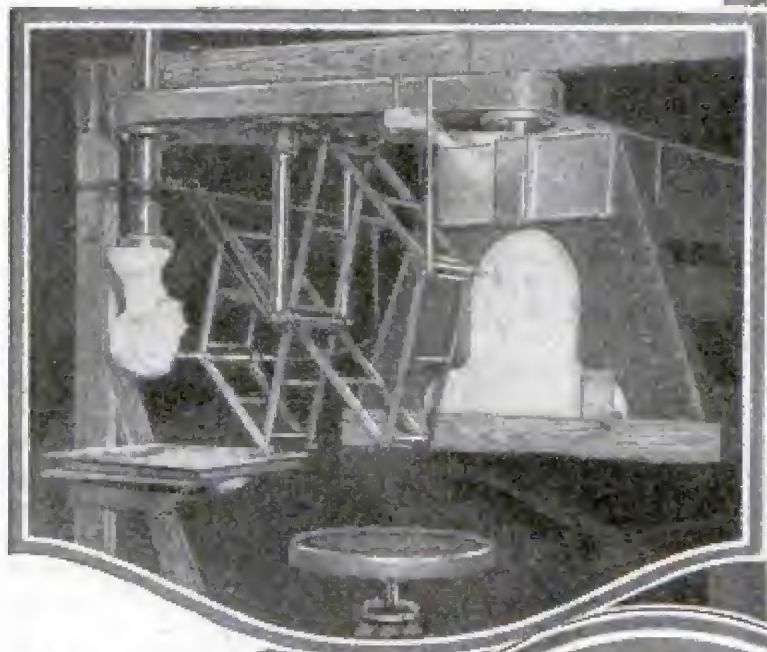
The beacon, post-office officials believe, would have averted many accidents in the past, notably the tragedy which cost the life of Pilot Ames only a few weeks ago. Leaving New York with the night mail, he became lost in the fog, and eventually crashed into a mountainside while trying to land beside one of the airway lights only six miles from his landing field at Bellefont, Pa. Had he been flying by radio compass, the interlocking signals would have guided him direct to the field. Some idea of the difficult terrain over which the night-mail flyers wing their way may be gained from the fact that, though Ames fell within six miles of his field, it took searchers ten days to locate the ship, the pilot being found dead at his controls. He had been struck on the head by a bit of flying wreckage.

The altitude finder would likewise have saved him from crashing into the mountainside by warning that the ground was sloping upward nearer and nearer to the mail plane. There have been several previous accidents in which flyers crashed into mountainsides, the most notable being the wrecking of the flagship of the round-the-world flight, piloted by Major Martin, on an Alaskan mountain.



Radio-Picture Apparatus Used to Transmit Written Orders, Instead of Code; Some Day the Post Office May Send a Picture of Extra-Special Delivery Letters in This Way

PORTRAITS COPIED IN STONE
FROM MOVIE FILMS



minute, the entire time that the model is needed. The film is developed and projected up-



An unsatisfactory photograph of his little daughter, gave a Chicago man the idea for a carving apparatus with which he produces portrait busts directly from motion pictures of the model, who is required to pose but twenty-five seconds. The photograph's fault lay in poor lighting, parts of the face were in deep shadow, others too prominent.

But in these masklike lines were the high lights and shadows a sculptor so carefully studies. The father, a mechanical engineer with a sense of the artistic, realized that a series of such pictures, taken from many angles, would give sufficient data for a bust. He therefore worked out his process, which consists in two main steps, taking the pictures and reproducing them in the desired material, stone, plaster of paris, marble or other substance. A pivot holder for a motion-picture camera is so adjusted that the instrument can be revolved completely around the model who sits in the center of the camera's orbit. Four hundred exposures are taken during only one rotation, which requires less than half a



The Copying Frame, the Artist at Work, and Daughter Holding a Bust of Herself

on a small screen in the copying frame, an adaptation of the pantograph. Only one picture is exposed at a time, and each is exactly life-size. As the operator traces the lines and depressions in each exposure, a little motor-driven cutter attached to the other end of a

swinging arm which supports the copying instrument, reproduces the image of the film in a block of the material of which the bust is to be made. A turn of a crank exposes a new picture and at the same time shifts the bust so that the lines cut upon it will conform to the planes exposed on the fresh view. By the time a complete revolution has been made, the block has assumed what is virtually an exact copy of the camera's record. A particular advantage of the process, it is claimed, is that busts of children may be made with little difficulty, a feat that often the most skillful sculptors are unable to achieve because the young models will not hold still and it is hard to produce a life-like expression.

W. H. Englemaun, 834 E. 51st St.

CARILLON DIFFERS FROM CHIME IN NUMBER OF BELLS

664 Highest and lowest notes on a set of chimes have a difference of little more than an octave and an average of ten bells composes the installation, while a carillon must have a range of at least two octaves, a minimum of twenty-three bells. It attains a maximum compass of four octaves and a half, or fifty-three bells, as is the case with the carillon in the Park Avenue Baptist church in New York City. Many different melodies as well as harmonies or chords to accompany them are rendered by the carillon, and mastery of the instrument is difficult. In Belgium, there is a national school for instructing "carillon-neurs," the art being taught with as great thoroughness as other music branches.

OLD AUTO MADE INTO TRACTOR WITH BINDER WHEELS

By cutting down the chassis of an old automobile and making other alterations, the car was remodeled into a serviceable tractor that pulled one sixteen-inch or two twelve-inch plows with little difficulty and did other duties about the farm. Practically the entire outfit was constructed from what ordinarily would have been

wheelbase of fifty inches and a tread of about thirty-six inches. The rear axle and housing were shortened and oxy-acetylene-welded to make a jackshaft which was fitted with a pinion on each side, to mesh with the driver gears on the traction wheels. The tractor turns in a fifteen-foot circle, has a speed of two to two and one-half miles an hour, and besides handling plows, can drag a seven-foot or nine-foot harrow or three thirty-one-inch lawn mowers.

657 YEARLY COST OF EACH PAUPER THREE HUNDRED DOLLARS

Maintenance of a pauper in the United States averages \$334.64 a year, and each has 2.14 acres of land cultivated for his support, figures from states of the union show. The value of buildings and equipment devoted to their care is \$1,118.96 per person. Wide differences were discovered between the states. For instance, in Nevada the cost each year per capita of inmates in almshouses is \$865.10, while in Alabama it is only \$187.53. Property investment per person cared for in the charitable institutions and on the poor farms of South Dakota is \$5,600, and but \$415.63 in Mississippi. A reason for the high expense in certain localities was seen in a large number of small establishments with less than twenty-five inmates each.

Labor Bureau



Saved from the Scrap Heap and Harnessed to Useful Farm Tasks; an Old Auto as Remodeled into Tractor

consigned to the scrap heap. The traction wheels were taken from an old binder, the lugs being removed and replaced with ones of two-inch angle steel. The chassis was cut down to a



Converter. Shaw Mfg. Co.,
and all necessary parts
Grassburg, Kans.



Unwary Owners Who Do Not Read Their Policies and Understand What They Cover, Often Lose for Failure to Obey Rules

AN autoist, hurrying down a narrow street, speeded up to pass a street car so he could turn into the track to go around a parked car. His effort to save a minute wasn't a success. With his car turned into the tracks at an angle of forty-five degrees, the street car caught its left side and shoved the right into the parked machine. Traffic was tied up for more than half an hour while the mess was unscrambled. The loss in time to those delayed, and the disruption of street-car service probably cost considerably more than both automobiles were worth. But that's another story—this one is about insurance.

Both the automobile owners had full coverage, and so their grief was somewhat allayed—until they tried to collect. After the wreckage had been removed from the right of way, the man who had lost a half hour and the use of his car by trying to save a minute caught a taxicab and hurried to the office. Pressing business occupied most of the morning, but about noon he remembered to notify his insurance agent. He explained the accident and the insurance office was very sympathetic, but very sorry. He was advised to read his policy again, and note particularly a clause which provided that, after an accident, the owner should remain with the wreckage until the insurance adjuster or garage man arrived.

The insurance company was properly sorrowful for his predicament, but he had left his car unguarded for hours, and that nullified its contract and he could collect nothing. And, as if that wasn't enough, the insurance company likewise pointed out he had violated another clause of his contract with it by not reporting the accident promptly.

The other fellow, the innocent victim

of the accident, whose car was standing still at the curb with no one in it, and who couldn't possibly in any way have been responsible for the accident or have avoided it, knew all about reporting accidents and guarding the wreckage to prevent pilfering of usable parts, which is the thing the insurance company seeks to guard against by inserting that clause.

He took the names and addresses of all the possible witnesses, got the story of the street-car motorman and the license number of the offending car, and then hopped into the nearest store, and, with one eye on the wreckage, called his insurance agent. The latter listened to his story and then explained he was very sorry, but the insurance issued by his company didn't cover the situation. The insured car, he explained, was standing still at the curb and his company's policies only covered damage incurred in accidents occurring while the car was in motion.

The only protection for the auto owner is to read and reread his policy until he knows every clause by heart, and, what is more important, understands the real meaning of the legal verbiage in which that meaning is guised. The insurance company tells you to read your policy, and prints that advice on it. If the insured fails to carry it out, the company is justified in disclaiming responsibility when you break the specific terms of your contract. Yet how many owners know what those terms are?

Suppose you are driving along the street; your attention is attracted by something in a store window; you look away for an instant, and ram the car ahead or brush a pedestrian aside with a fender. Do you get out and apologize for your carelessness or do you bawl out the other fellow for being in your way?

When You Brush a Pedestrian with Your Fender, Do You Stop to Get His Name and Report the Affair to Your Insurance Company? He May Sue You Months or Years from Now; If You Knock Down a Cyclist, Do You Know How to Make a Settlement?



damages without a fight, if there is any chance of winning that fight, and when you accept the responsibility, you have made it impossible for the company to fight.

You may have only brushed the pedestrian with a fender—not even knocking him down—and decided he wasn't damaged, so went right along without getting his name or reporting the facts to your insurance company. But he caught your license number, and a day or two, or a week or a year or several years later, he



The first is the polite thing to do, but if you do it and he comes back with a suit for damages, you might as well kiss the money goodbye, for your insurance company very probably will not stand behind you. You have violated another term of your contract, which says you must accept no liability for any accident, and when you apologized you implied you were responsible. The insurance company naturally does not want to pay any

may go to the hospital, claim he was injured by your car, get medical treatment, and then sue you for \$50,000 or \$100,000 damages. If he does, you haven't a leg to stand on with your insurance company. You didn't take the pedestrian's name and you didn't report the accident to your insurance agent promptly, as required. The company washes its hands of you, and you can face the jury alone. Suppose the pedestrian you hit is an eleven-year-old

boy playing in the street. He isn't injured much, outside of a strained back, and in a few days he recovers from that. You are very sorry for having hurt him, and gladly pay the doctor's bills and a bit besides, and, being a careful person, ask his mother, who is present, to sign a release from all damages.

Let ten years pass, and you have forgotten all about the affair until one day you are served with a summons in a damage suit for \$100,000. The eleven-year-old boy of ten years ago has just turned twenty-one; from some cause has become hopelessly paralyzed, and, under the advice of a doctor or lawyer, has decided that the slight injury a decade before is responsible for his condition.

Being a careful person, you put the release from all damages in your safe-deposit box and you bring it out and take it to your attorney. He investigates the case and then explains that in your state only the father can sign such a release for a minor child, and, as the father was away from home when you gave the lad a cash present and got his mother to sign the release, the paper is of no value.

You go into court. The boy, just on the threshold of manhood, is there with his physicians who will testify that he is a hopeless invalid for life. His potential earning power as a healthy man for the expectancy, or probable length of life, which insurance actuaries would credit him with, would amount to such huge figures that a sympathetic jury may not feel his claim for \$100,000 is at all too high.

Perhaps this case doesn't fit you—yet. You are insured, and if you hit a boy tomorrow, the insurance company, you say, will protect you. It will, up to the limit of your policy, but is that policy written to provide \$5,000 damages for injury to one person and \$10,000 for injury to two, or is it for some higher figure? And how far will \$5,000 or \$10,000 go in paying off a judgment for \$100,000?

You may have one of the bigger damage policies, paying \$100,000 for death or injury of one person and up to \$300,000



Spare Tires and Other Removable Equipment Are Not Ordinarily Covered by Insurance, But May Be if the Thief Tried to Steal the Car Too

for death or injury of two, and in that case you are fully protected, if—and note this carefully—the company which insured you is alive and paying damages ten years from now. Is your insurance in an old and established company which has a reasonable expectancy of being alive a decade from now, or did you shop around for the cheapest rates you could get, and buy a policy in some struggling concern which may have a run of hard luck because of too many damage claims and go into the hands of the receiver?

You can get good insurance that will cover every possible situation, if you pay for it, and get it in a company which writes policies with fairly reasonable clauses and avoids the jokers. The insurance you buy can be varied to suit your purse and your needs, and if you understand insurance you can save enough on some items to get extra protection on others. Suppose you store your car in a fireproof garage, where attendants are forbidden to smoke, that you always stop your engine before filling the gasoline tank, and that the make is a good one, with a well protected electrical system which has a good reputation for not catching fire. Under those circumstances you

might take a chance and dispense with fire insurance, or cut it to a minimum.

You may be able to save on theft insurance. Do you make a habit of leaving your car on the street for any length of time, and at the same place, where thieves can become accustomed to your movements? Is it a make popular with thieves: are you absent-minded and apt to leave it unlocked; if you have a private garage, is it likely to tempt thieves, and if you store your car in a public garage, is the owner a responsible person? All those things affect the amount of theft insurance you will need.

Collision and property-damage insurance will depend upon your carefulness as a driver, your nervousness and quickness to react to an emergency, whether other members of the family drive your car, whether you drive in congested districts, whether you have bumpers and a stop-light, the weight of your car, and whether, in an accident, it is more apt to inflict than suffer damage.

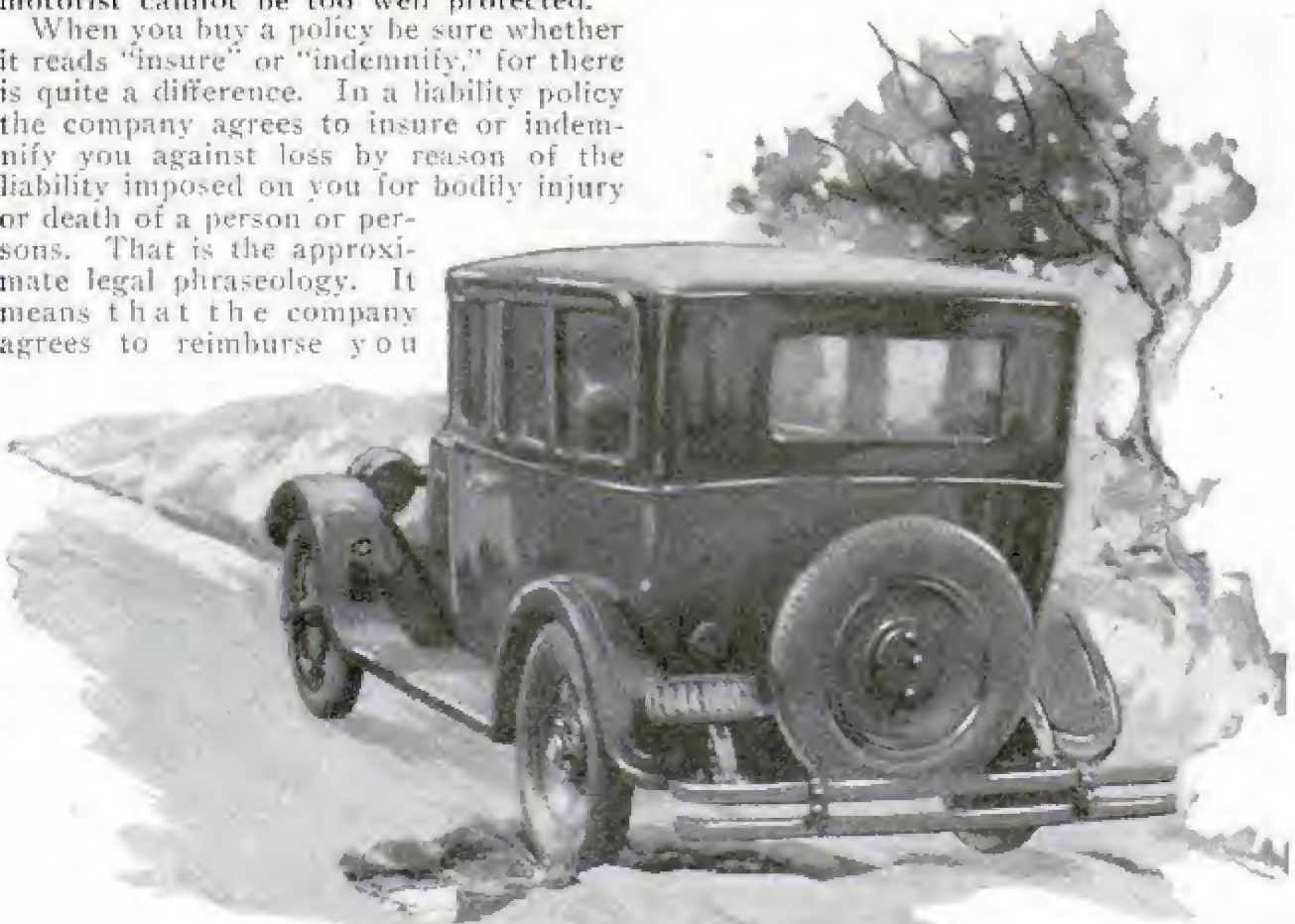
Liability coverage is something every one needs, and with the verdicts awarded in damage suits during the last few years showing a constant tendency to rise, the motorist cannot be too well protected.

When you buy a policy be sure whether it reads "insure" or "indemnify," for there is quite a difference. In a liability policy the company agrees to insure or indemnify you against loss by reason of the liability imposed on you for bodily injury or death of a person or persons. That is the approximate legal phraseology. It means that the company agrees to reimburse you

after judgment has been taken and the money collected from you. Obviously, the company cannot legally promise to pay you before the loss has been sustained.

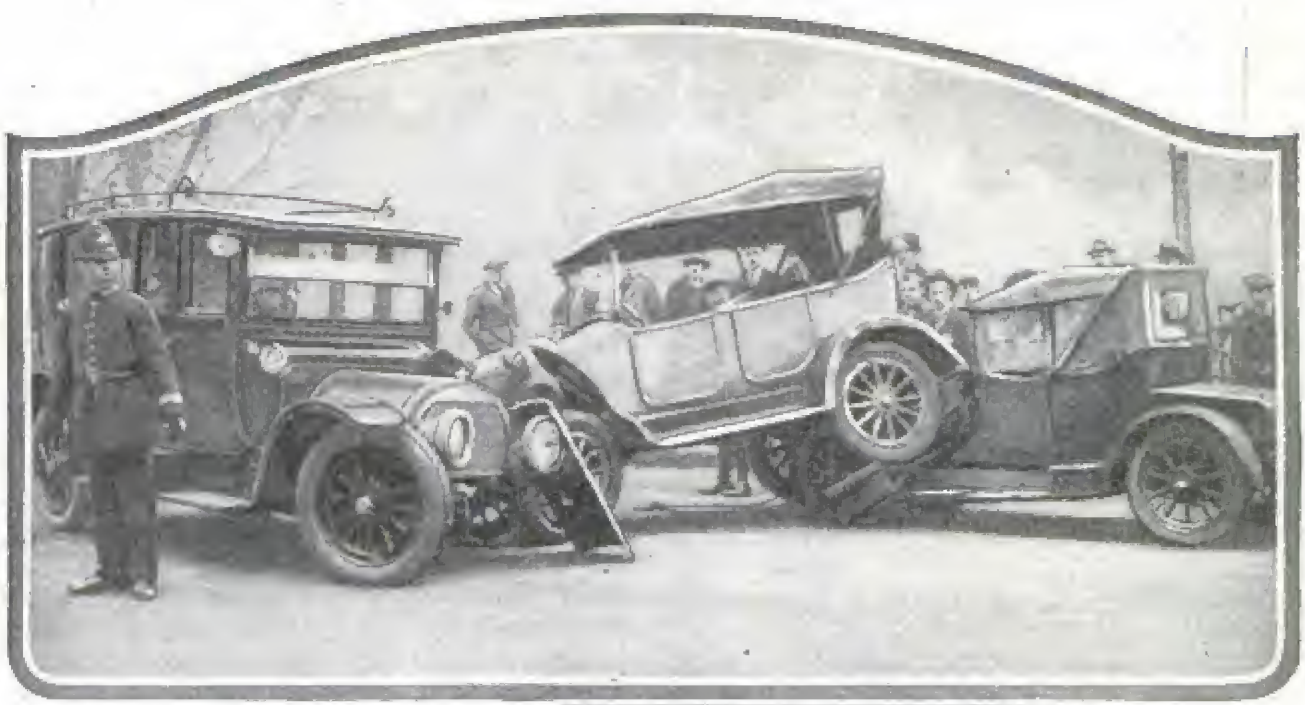
But some companies will let you pay the judgment, and if you can't pay, they refuse to settle, since you have suffered no loss, as yet. But the judgment remains hanging over your head ready to be levied on any future property you may acquire. Other, and responsible companies, voluntarily pay legal claims out of their coffers without forcing policy holders to sustain the loss first. It is important to be sure which kind of company you hold a policy in. If it is the first, you may have an accident and then find your home taken away from you to pay the judgment, after which the insurance company will reimburse you.

If you have a standard policy, it may include, and you may have failed to note, a clause relieving the company from liability while your car is towing or propelling any trailer or other vehicle. If you have a touring trailer or are in the habit of helping unfortunate motorists by giving them a tow, be sure the policy is amended in writing to cover the point.



Collision Insurance, if You Have No Deductibility Clause, Will Cover Damage Done to a Spring When Your Car Strikes a Bump or Drops into a Rut, But Costs Considerably More

254



A Triple Crash in London; Either One of the Cars at the Right Might Be to Blame, a Nice Point in Fixing Damages: Fire Insurance Is Needed Often, But Is Cheap and Protects You against Accidents like That Below

If other members of the family or friends drive your car, you should be sure the policy covers any damage they may do to property or other persons. Most policies stipulate that the company's liability shall apply to you first, and then, if there is any balance of the liability left, it will apply toward judgments against your friend who was driving the car at the time of an accident. In other words, if you had \$10,000 liability coverage and a jury rendered a joint verdict against the friend who was driving and you as owner of the car, and that verdict was for \$8,000 each, your insurance company would pay your share, and apply the \$2,000 remaining to your friend's share.

There is an interesting legal point involved here. If your friend drove the car at your request, he is acting as your agent and you are responsible for any damage he does. If he asked permission to drive the car, then he alone is responsible. But if your policy covers not only your liability but that of family and friends, then your insurance company will protect him up to the limit of the policy.

If your chauffeur or a garage employe takes your car out without your knowledge and has an accident, then your policy does not protect him, but does safeguard you.

On the other hand, if you send the car to the garage for repairs, and during the



course of the work it is taken out by a garage mechanic for testing on the road, and he has an accident, the injured person has a good chance of getting a verdict against you, particularly if you have money and the garage employe or owner has not. In this case your insurance policy will be absolutely worthless unless you have made sure that it does not contain a clause disclaiming liability in event of any accident incurred while demonstrating or testing the car.

There are even jokers in the theft policies. In large cities, it is common in standard policies to class spare tires, spotlights, motometers and other easily removed accessories with the tools and repair equipment, and refuse to insure them against theft, unless they are stolen along with the entire car.

But suppose a thief tries to steal your car, pushes it around the corner, is un-

able to get it started, and then steals the spare tire. You present a damage claim for loss of the tire, but the insurance company may deny it, on the ground that you still have the car. Unless you get the thief and have him admit he tried to steal the entire car, there is not much chance of collecting.

Few autoists know that their insurance policy will cover injuries sustained by members of their own families, suffered while the insured is driving the car. Yet a jury in a New Jersey court recently awarded a verdict of \$800 to a girl whose nose had been broken while she was riding in the automobile driven by her father. To fix the liability of the insurance company, the girl brought suit, naming her father as defendant and charged him with reckless driving. The jurors decided she had proven her case and awarded the verdict, which was against the father, but came under his insurance policy, so the insurance company had to pay.

In a similar case in New York, a mother, as next friend to their minor child, brought suit against her husband, alleging that the father told the boy to wait for him on the running board of the car, and then returned, jumped in and started

to drive off, forgetting about the boy, who was thrown to the street and injured. The suit was just a friendly one simply to determine the amount the insurance company should pay.

In both these cases the owner of the car carried adequate insurance, but there is always the possibility that an uninsured autoist may some day face the same situation, have a jury decide against him, and have to pay the indemnity out of his own pocket.

Damages awarded by juries, as has been pointed out, show a constant tendency to increase. Death cases where \$5,000 to \$10,000 insurance once offered adequate protection, now are settled with verdicts for anywhere from \$15,000 to \$50,000, or even more. When you buy liability insurance, it is well to learn the temper of juries in your vicinity and see what size damages have been awarded.

This is only a bare outline of some of the things that may happen to you if you don't read your auto-insurance policy, and read it until you understand every phrase. There are plenty more, and if you ask a friend who has had an accident, he probably can tell you some of them from personal and sad experience.



If You Drive in Heavy Traffic, Are a Poor Driver, or Are among Other Poor Drivers, the More Accident Insurance You Carry the Better; a Street Car or Truck May Do This to You Any Day

FISH AND WHALES ARE LABELED TO TRACE MOVEMENTS 683

To find out how long whales live, how far they travel, and other facts concerning them, small identification darts are fired into the thick layer of blubber on the back of the monsters with a specially designed crossbow. Each dart has a label attached, and hunters, finding one of the tagged whales, report the legend on the marker, a record of which is kept at the British colonial office. This plan of identifying creatures of the sea is also applied to salmon, mackerel and haddock. The fish are caught in a trawl net, and the best specimens are labeled with two disks, held together by silver wire, which is threaded either through the back fin or the hard lap covering the gill. The disks are marked with letters and numbers, and for the capture of each fish and the report of its marker, a reward is paid. By this means, it was found that one young plaice covered 210 miles in eight months, another 175 miles in three months. A salmon labeled in the spring of 1919 was three feet long and weighed thirteen pounds. Recaptured the next autumn, it had doubled in weight and had grown six inches in length. Even crabs travel long distances. One was found 100 miles from the place where it had been tagged.

FOLDING LID FOR CAMP BUCKET 623 FITS IN GRIP

Fastened with strong spring clips and fitted with a screen strainer on one side, a folding top for the camp bucket can be carried inside the grip or tucked away in almost any small space. It is made of galvanized steel and is adaptable to many uses, as on a minnow pail, a lid for the cooking pot—the screen permits easy draining—or a cover for the water bucket. One side of the top can be raised to permit the use of a cup or dipper, and the screen holds back sticks and refuse in case the container is used for filling the automobile radiator.



Wallace Hardware Co.

GIANT HORSES CARVED IN STONE FOR KING'S MEMORIAL 652

Details of the monument in honor of King Victor Emanuel II in Rome include the figures of enormous horses which



Carving Horse's Head. One of the Details of Huge Monument to King Victor Emanuel II in Rome

were carved in sections and put in place with tackle because their huge size forbade shaping them as a single unit. Although the replicas are not intended for close scrutiny, they are accurately and carefully fashioned.

MIRRORS AID TO SUN IN DRYING AND COLORING MACARONI

By using mirrors to supplement the sun in drying macaroni, manufacturers of the product have found the color to be more satisfactorily preserved, since the deep yellow tint is not bleached so easily, and the flavor also is said to be improved. The process is quicker than sun-bleaching.

685
Mr. George H. Hedges, Esq.
Highfield View, Tapton
Woodhouse, Eng.
Chertwell, Eng.

ROLLERS HOLD WINDOW SASH WITHOUT WEIGHTS AND CORD



Windows are held at any desired level by a pair of rollers attached to an adjustable tension spring. They are set in the side of the sash and simplify installation, since no space is needed for weights and cord, and the frames can be placed against a brick wall if desired. The tension of the spring may be adjusted so that

it will hold a heavy window as securely as a lighter one.

GROWTH OF CEMENT INDUSTRY SPURRED BY PAVING

The United States now produces more Portland cement than all the rest of the world combined, government figures show, and the rapid growth of the industry is seen in the increase of shipments. In 1914, the total amount was 86,437,956 barrels, while the estimated shipments for last year were 145,747,000 barrels. Nearly twenty-five per cent of this total was consumed in paving and road building. In eight years, the demand for cement for road purposes alone has increased more than 400 per cent.

WOOL MUDGUARDS FOR ANKLES PROTECT AGAINST SPLASHES



To shield the stockings from mud splashed by automobiles in wet weather, women are wearing gaiterlike protectors of wool. They fit tightly about the ankles, are easily removed or put on, prevent damage to fabrics, and afford comfort in cold weather.

COLLEGE HAS "TIN-PAN ALLEY" TO TEST GALVANIZED WORK

Steel articles that have been coated with zinc, cadmium, lead, nickel and other metals through different galvanizing processes are to be left out in the open for an indefinite period, possibly thirty years, at Pennsylvania state college, to test the ability of the objects to resist corrosion. The experiment ground has been called "Tin-Pan Alley" and the "Acre of Metal." A wide variety of specimens has been selected for the time and weather test, including drinking cups and sheet roofing.

FOLDING BAG FOR FISHERMEN FITS IN SUITCASE

Fishermen are spared the trouble of extra luggage by a folding creel that fits flat when collapsed, so that it can be carried in a suitcase, is easily strapped to the saddle or may be tucked under the automobile seat cushion. It is made of water-proof duck which has been treated to prevent mildewing, is bound with leather and rubber-lined. There are no rods to adjust, ventilating holes are provided, and a pocket for bait is arranged in the top.



Ways to improve beds sought by studying sleepers

WAYS TO IMPROVE BEDS SOUGHT BY STUDYING SLEEPERS

While twelve young men students at two eastern schools slept in specially prepared cots, scientists each night studied their movements to learn the effects produced by different types of beds and bedding, and the relation between fatigue or various mental conditions and sleep. A recording apparatus was attached to each bunk for registering the degree and time of movement of its occupant, to indicate periods when there was not complete relaxation. Another instrument gauged the mental alertness of the subjects, their degree of tiredness or efficiency. The experiments are to be conducted over a long period, possibly for several years, to obtain facts from which reliable conclusions may be drawn, so that better conditions for sleep may be achieved.

Dr. H. M. Johnson
Wellington Institute

Compressed Air
Hobbs, 1923
Rogers Lock & Sash
Holder Co 1830 Tritone
Tower, Chicago

no data

Los Angeles Calif
State College. Pa. St
Fishing
University of Pittsburgh
Pittsburgh, Pa



By HAROLD T. WILKINS,
Brixton S.W. 9, London, Eng.

4, Crowhurst Road,
London, Eng.

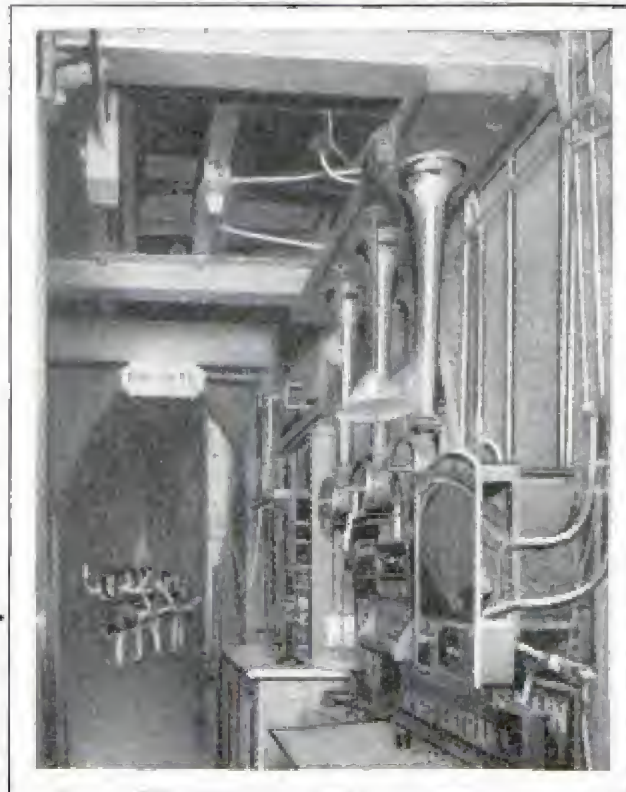
EELIMINATING massive scenery which cost more than \$20,000 for a single set, a new electrical effect achieved by the Paris opera has made possible a far more realistic scene, with no equipment beyond a simple white sheet, made transparent by glycerin, and a battery of light projectors. The first scenery-less scene attempted showed the rush of the messengers of Odin in Wagner's "The Ride of the Valkyries."

The success of the experiment added another credit for the stage electrician, who is fast becoming the most important man back stage. The old equipment of footlights and an occasional spotlight has been replaced by huge installations, such as that at Drury Lane theater, London, which uses between seven and eight thousand lamps, ranging from individual colored globes to huge searchlights and

mammoth "sun" arcs, consuming one hundred amperes each.

The master electrician who controls the enormous back-stage switchboard and achieves the lighting effects that make modern spectacular dramas possible must not only know his lights, but know the play as well as the man who wrote it. An opera-house electrician is required to know every note of the score of every opera produced just as well as the director of the orchestra. With his own copy before him on the music rack, the electrician plays the opera through in lighting effects, moving the multitude of switches in accordance with his penciled notes on the sheets of music.

The old-fashioned equipment for the valkyries' ride in the Wagner opera required several tons of properties, including a tremendous assemblage of tower-



What the Stage Manager Sees from His Corner—a Glimpse of a Rehearsal



In the Scenery Studio Where a Wide Range of Settings Are Constructed and Painted

ing mountains and fantastic properties, with the movable specters mounted on iron rails. As played by electricity, the scene uses a few glass slides, three projectors and the white curtain at the back of the stage. The singers on the stage are illuminated by spotlights in the wings, instead of footlights, so their shadows will not be cast on the transparent back drop. The valkyries themselves are painted on one set of glass slides, the background on

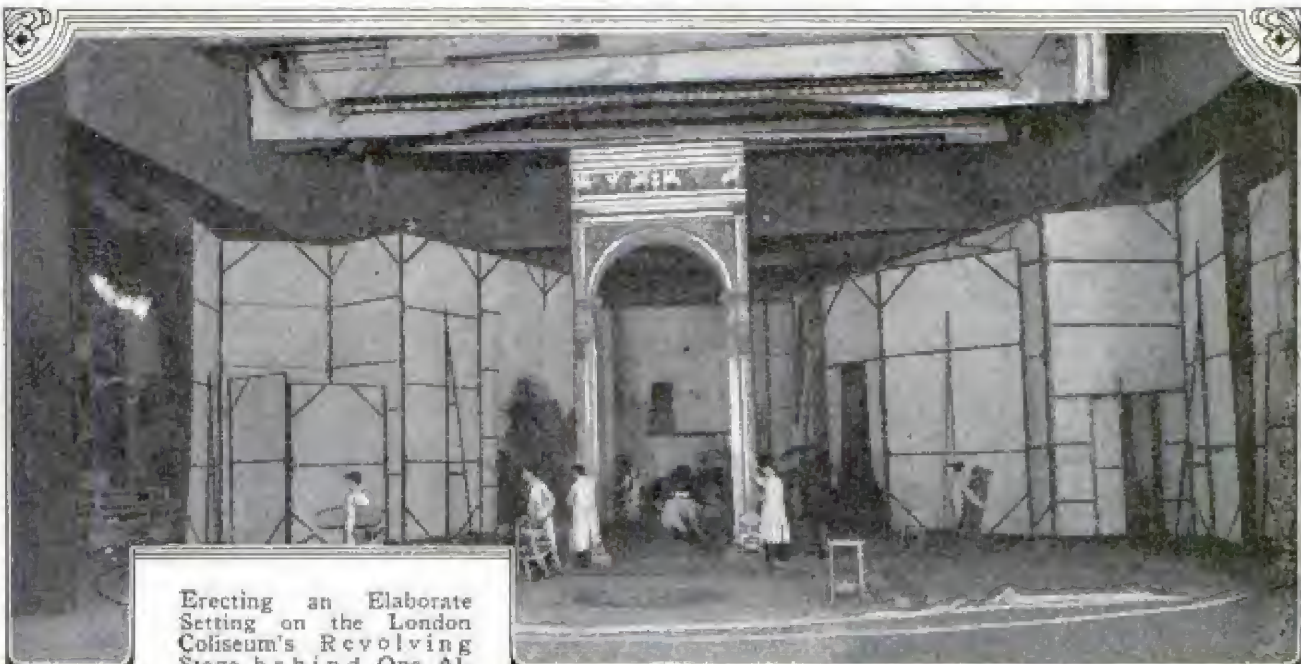
another and the sky on a third. Sky and background move across the transparent sheet in opposite directions, while the valkyries, appearing very small near one corner, grow larger and larger as the projecting focus is changed, and at the same time move toward the center of the sheet, until they appear to fairly leap out of it. The projectors are located behind the scene, throwing the light through it, just the reverse of movie projection.

The stage effects used in a spectacular production such as those featured at Drury Lane consume an enormous amount of electricity. A single scene from "Decameron Nights," one of the big spectacles, used 184 big 500-candlepower lights just to illuminate the set, in addition to all the special lights which produced various effects. Back stage there are two huge switchboards, one in a fixed balcony, where the master electrician presides, and the other movable so that it can be placed at any desired point in the wings. Each battery of lights is controlled by a separate switch, with twelve positions, giving as many gradations from full light down through various shades of dimness until the current is shut off.

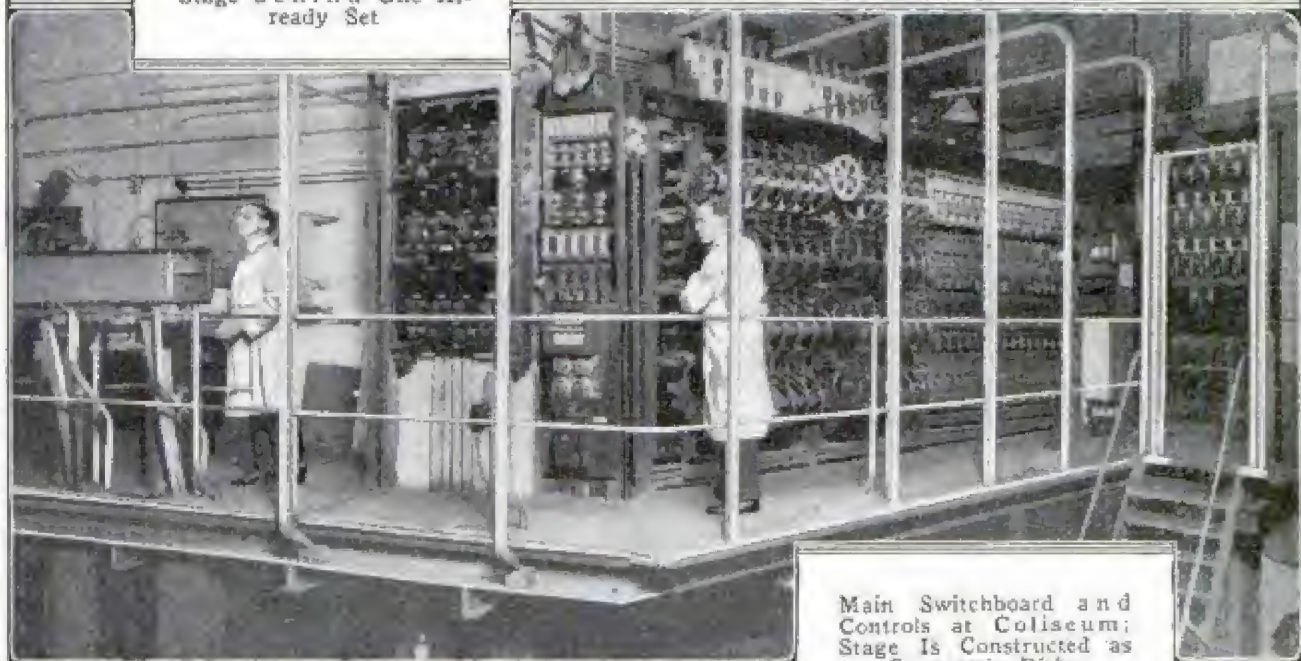
In the Boccaccio presentation of Damascus splendor, a huge company of crusading knights in glittering armor, swords at their sides and with the cross of the crusades blazoned on each breast, gather with tonsured monks in the vast nave of a Gothic cathedral setting. They face the high altar and, to the tones of a huge organ, chant the solemn Gregorian music of the Middle Ages. As the chant dies away the artificial sunbeams, pouring down in



Property Room and Some of the Craftsmen Who Construct Materials for Special Scenes; Their "Stock" Ranges from Frescoes for Egyptian Tombs to Children's Gocarts



Erecting an Elaborate Setting on the London Coliseum's Revolving Stage behind One Already Set



Main Switchboard and Controls at Coliseum; Stage Is Constructed as Concentric Disks



Track and Apparatus beneath Revolving Stage, 225 Feet in Circumference and Seventy-Five in Diameter

dancing streams through stained-glass windows, pale and the knights file out, bound for the gates of Jerusalem. The picture slowly dissolves as the lights in the cathedral grow faint.

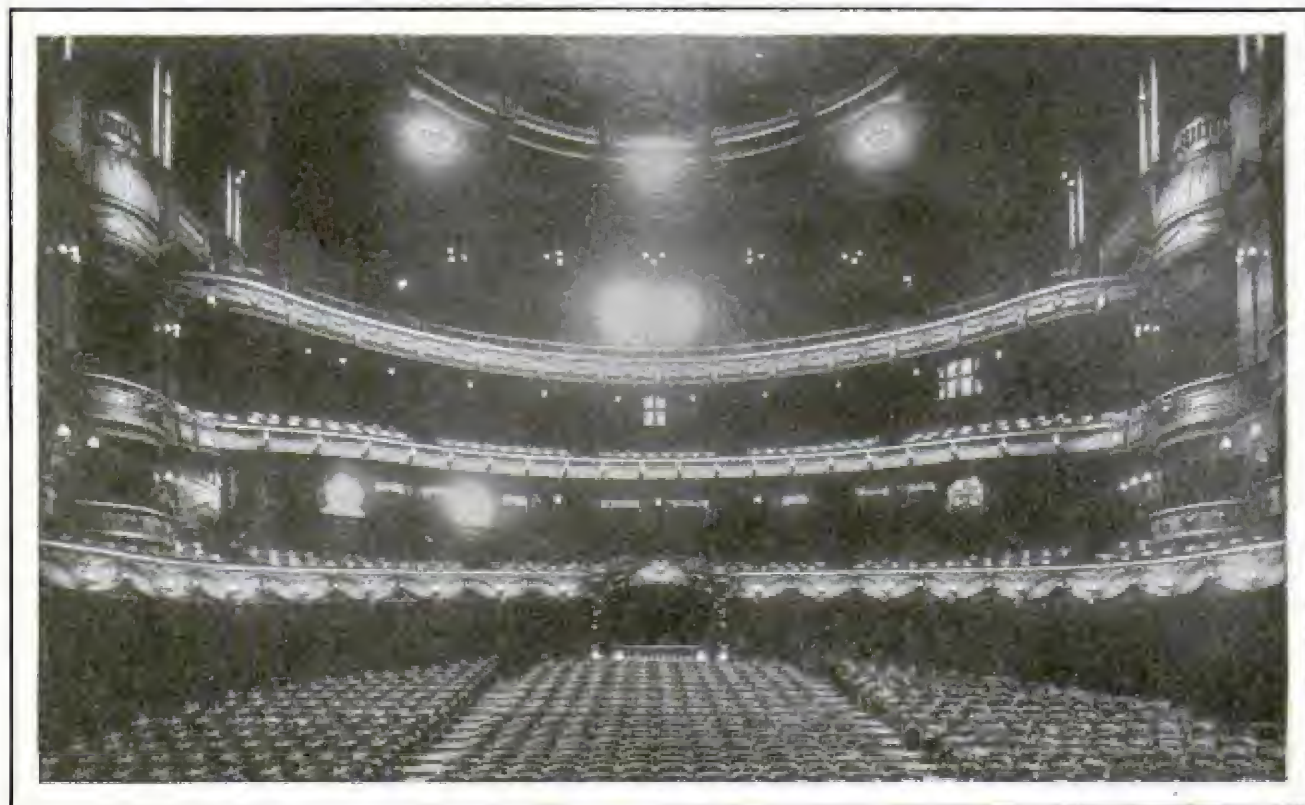
Again the curtain rises and the audience is transported to the Bridge of Sighs, watching through the colonnades as the gondoliers dreamily glide down the canals of Venice, singing their boating songs. Again the magic carpet of lighting changes, and the spectators see the hanging gardens of Damascus, then enter the palace of the Soldan, with its baroque splendors of Oriental light and color, picturesque eastern mobs and be vies of dancing girls in voluptuous seraglios. The climax comes when the whole company descends, in front of the audience, a staircase leading down behind the footlights, the Soldan of Egypt resting on the shoulders of his attendants, and behind him Saladin, Prince of Damascus.

Back stage, in wings and galleries rising nearly 100 feet above the stage, and below the scene in hidden pits, a small army of unseen workers have carried the scenes through. Even the descending staircase, where none had been before, was manufactured in a twinkling by engineers so far removed from the stage that they were directed by flashing electric lights and could only see the stairs take form by watching their gauges which reflected the movement.

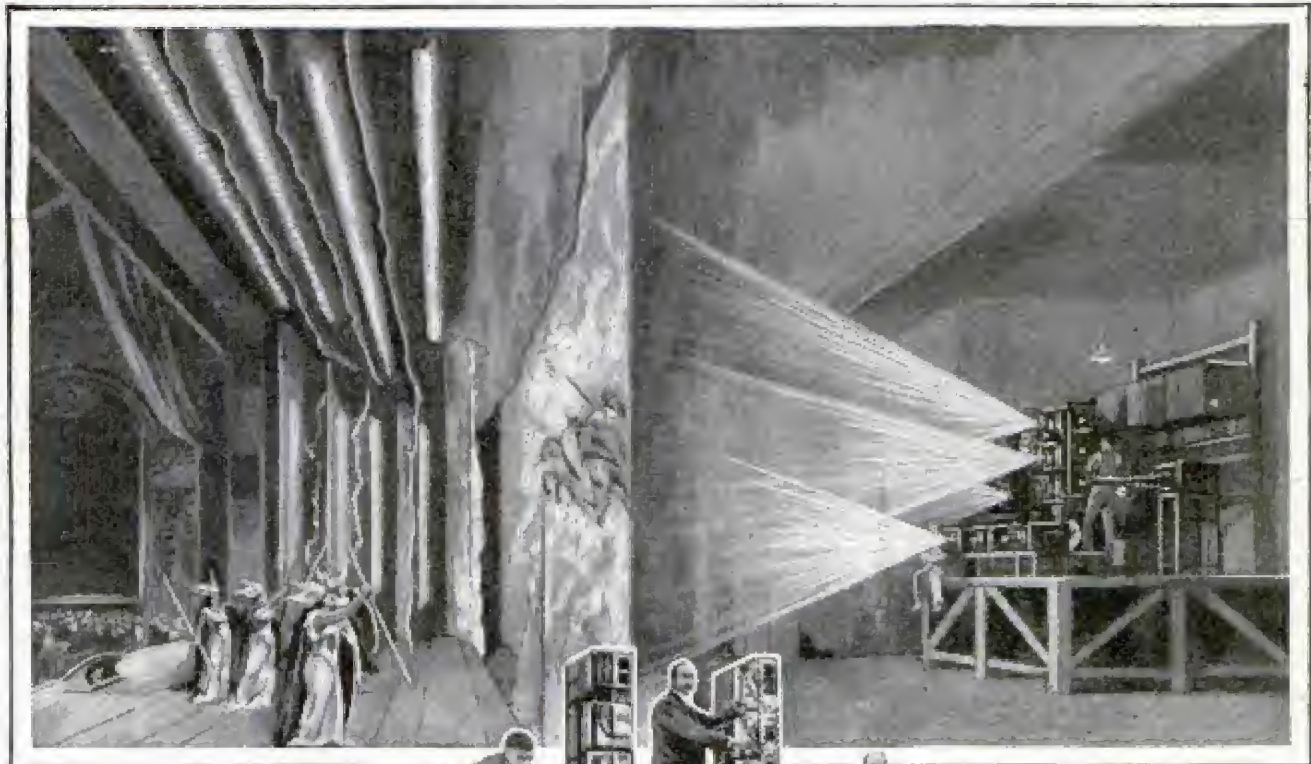
Hanging from the walls of the wings, and stretching across stage far above the proscenium arch are row on row of lighting bridges, lined with big lights and banks of small ones. Huge panorama lights, with seven ranges of colors and thirty-six 2,000-candlepower sun arcs, which can be slowly dimmed or strengthened, give realistic sunrise or sunset effects. Ten banks, each containing 260 forty-watt globes, with three color circuits, sweep waves of color across the actors and scenery as desired. Down from the high lighting galleries in the wings an even dozen white lights, of 24,000 candlepower, cast brilliant light over the stage. Another battery of these 2,000-candlepower globes is spread along the front of the stage, just before the footlights, to paint out shadows which may be cast by the lights from above.

On either side of the stage, five horizon lights, also of 2,000-candlepower each, chase the shadows from the tops of towering scenery, or sweep across the stage level. And if even more and whiter light is desired, there are batteries of oxygen tanks and gas containers ready to illuminate groups of big limelights, capable of throwing the mountain peaks or castle turrets of spectacular scenes into high relief.

The color lighting of iridescent costumes is controlled by a group of high-power arc lamps and an extra battery of twenty-four limelights. On either side the



Interior of the London Coliseum: with Its Tiers of Luxurious Seats and Artistic Lighting, the Modern Theater Auditorium Is Planned to Harmonize with Its Stage

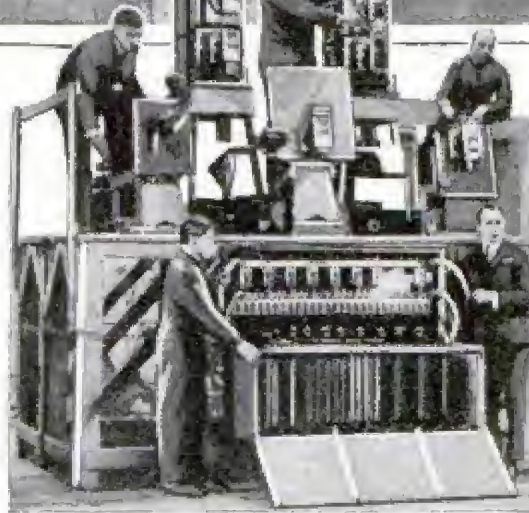


stage, a group of fifty-six big globes in three circuits of five colors bathes the performers in streams of blue, yellow, pink, amber and white light, the gelatin color screens which produce the effects being controlled by automatic apparatus.

With the entire outfit working, the stage electrician can eliminate most of the hanging cloths and painted friezes used in the past to represent sky and clouds, along with the lights which formerly illuminated them. The illusion of sky and horizon, cloud and tempest, rain and sunshine is created entirely by cleverly focused lenses and white and colored lights, combined with photographic projection apparatus.

Even more unusual than the lighting arrangements, however, is the group of bridges which can be turned into a stairway, if desired, or used to produce a shipwreck at sea, a train wreck on land, or any other spectacular effect involving disappearance. Six sections of the floor are movable, two controlled by hydraulic lifts, two by electric motors, and two by handwheels and counterbalances.

In one Drury Lane spectacle, an ocean liner on the stage battled a terrific tempest. The ship rose and fell and rolled



Courtesy Eugene Frey, Paris
Projector and Screen That Replace a Complicated Set in an Opera Act

from side to side in the storm, while rain fell in torrents. Suddenly there was an explosion and blinding clouds of steam shot up, hiding the helmsman from view, then the stricken ship, with boilers presumably blown up, sank below the stage. The illusion was produced by mounting the ship on one of the hydraulic lift bridges, with a ball and socket joint by

which it could be pitched and rolled in the seas. At a signal flashed by the electrician to the theater boiler room, the engineer opened a valve and shot a jet of steam through a flexible connection to the scenery on the stage, while at the same time a flash pan of powder was exploded. Then the hydraulic bridge was slowly lowered, carrying the ship with it.

In another production, a locomotive dashed onto the stage, a real whistle shrieked with real steam supplied by the same flexible tube, and the engine dashed over a parapet wall and plunged into the pit, a mass of smoking wreckage.

Like the vast batteries of lights, the bridges and other mechanical effects are all directed from the chief electrician's gallery. Watching the stage from his high vantage point, he sends each bridge operator his cue at the right moment.



South American Suspension Bridge, Five Hundred Feet Long, Is Tied Together Wholly with Knots, No Nails Being Used

BRIDGE BUILT WITHOUT NAILS IS TIED WITH KNOTS

With a span of 522 feet, a suspension bridge over the Rio Uribante near San Cristobal, Venezuela, contains no nails, bolts, screws or rivets, but is held together entirely by a special system of tying the natives use. The superstructure is of wood and is hung by long cables from uprights on either side of the stream. Besides being strong and durable, the bridge has a neat appearance, rivaling that of steel structures of similar types.

FUEL GAS GENERATED AT HOME IN CHARCOAL BURNER

Gas for cooking, heating water or warming the house may be generated at home in a small plant that uses charcoal. The apparatus requires no attention except to fill the hopper with a sack of fuel once each day and remove a small quantity of ash. Gas is derived from air and water vapor passed over the glowing charcoal by a small electric suction fan. It is not stored but is used as made and the supply is easily regulated by adjusting the burners.

Germany is developing an artificial wool which is produced from pine wood.



Home Gas Generator Complete; Inverted Bag of Charcoal Fuel on Hopper of Main Unit

HOW FOREIGN MAIL IS GUIDED TO PROPER ADDRESS

Due to the skill of handwriting and language experts of the post office department, only a small percentage of the thousands of letters annually received from foreign countries fail to reach their destinations. A day's mail at the Washington office, for instance, will include missives written in Pali from Baluchistan; in Hindustani from Burma, or in Senegalese from the Orange Free States.

One from Perak, Federated Malay States, written by an Eurasian, falls upon the clerk's desk. The address extends from the upper left-hand corner diagonally to the lower right-hand corner. To the layman, it is a puzzle, but the translator ponders a moment, then writes the English equivalent of the strange characters below the foreign address for the guidance of the postman. One of the important duties of these special clerks is re-addressing mail directed to places in countries that no longer exist, such as Prague and Trieste. Constantly changing boundaries in such regions as the Balkan states and others, demand that the post-office workers keep abreast with the times. Where boundaries are still in doubt, the mail is sent to the most probable distribution point. By long experience, these expert clerks acquire an extensive knowledge of towns, cities and streets the world over. Without consulting a directory, they know that a letter addressed to Ovid is probably meant for New York, although the state is not specified, and that Ponchatoula is in Louisiana, and so forth.

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Smith & Leas Engineering Co., Dayton, Ohio.
Moraine City, Ohio.
Leas Research Co., Moraine City, Ohio.

(J. H. Smith)
Moraine City, Ohio

Box 384, Berkeley Calif.
**CAR IS PARKED IN THE ATTIC
OF HILLSIDE HOUSE** 658

Built on the slope of a steep hillside, a house in a Pacific coast city is so arranged that the garage is in the attic and is reached by a roadway at the rear of

produce the ringing music frequently heard on summer evenings. An individual insect is difficult to locate, for the sound seems to shift and eludes the listener, but the cricket, when found, proves to



Auto at Door of Attic Garage, Which Is Built as Part of House on Steep Hillside; Steps Lead Down to First Floor of Dwelling

the dwelling. The plan saved the cost of an extra building, which could have been erected only at considerable expense because of the location. 668

**INSECTS DON'T SING, MUSIC IS
OF INSTRUMENTAL TYPE**

While the sounds made by various insects are familiar to almost everyone, not many know just how the tones are produced, and even scientists are perplexed as to the reason for their choruses. In a recent report from the Smithsonian Institution, it was pointed out that insects do not really sing at all, that is, produce tones by vocal cords. Their music originates from special organs most of which correspond to drums. The vibrations are set up by two general methods, by rubbing and by muscles attached to the vibratory surface. One species of grasshopper plays on two "fiddles" at a time; the strings are its front wings and the bows its hind legs. The katydid produces its peculiar sound by rubbing the file-like surface of its left wing over a ridge or scraper on its right, although the tone and volume of the notes are due in part to the vibration of the membrane on its wings. The musical organs of the cricket are like those of the katydid, except that the parts are equally developed on each wing. Their method of playing is generally the reverse of that of the katydid, the right wing being kept on top of the left. Tree crickets

be a slim-legged pale-green creature with hazy wings over its back. To produce the song, these are raised and rubbed together so rapidly that their outlines become almost invisible. The cicadas, popularly but inaccurately known as the locusts, have an oval membrane like the head of a drum, set into the solid rim of the body wall just back of the base of each wing. These membranes are set in vibration by muscles, and the sound is due to a cavity in the insect's abdomen.

2838
**INSULATED-WIRE CONNECTOR
REPLACES TORCH AND TAPE**

Insulated wires can be joined quickly and easily with a connector that requires no wrapping tape, torch or solder.



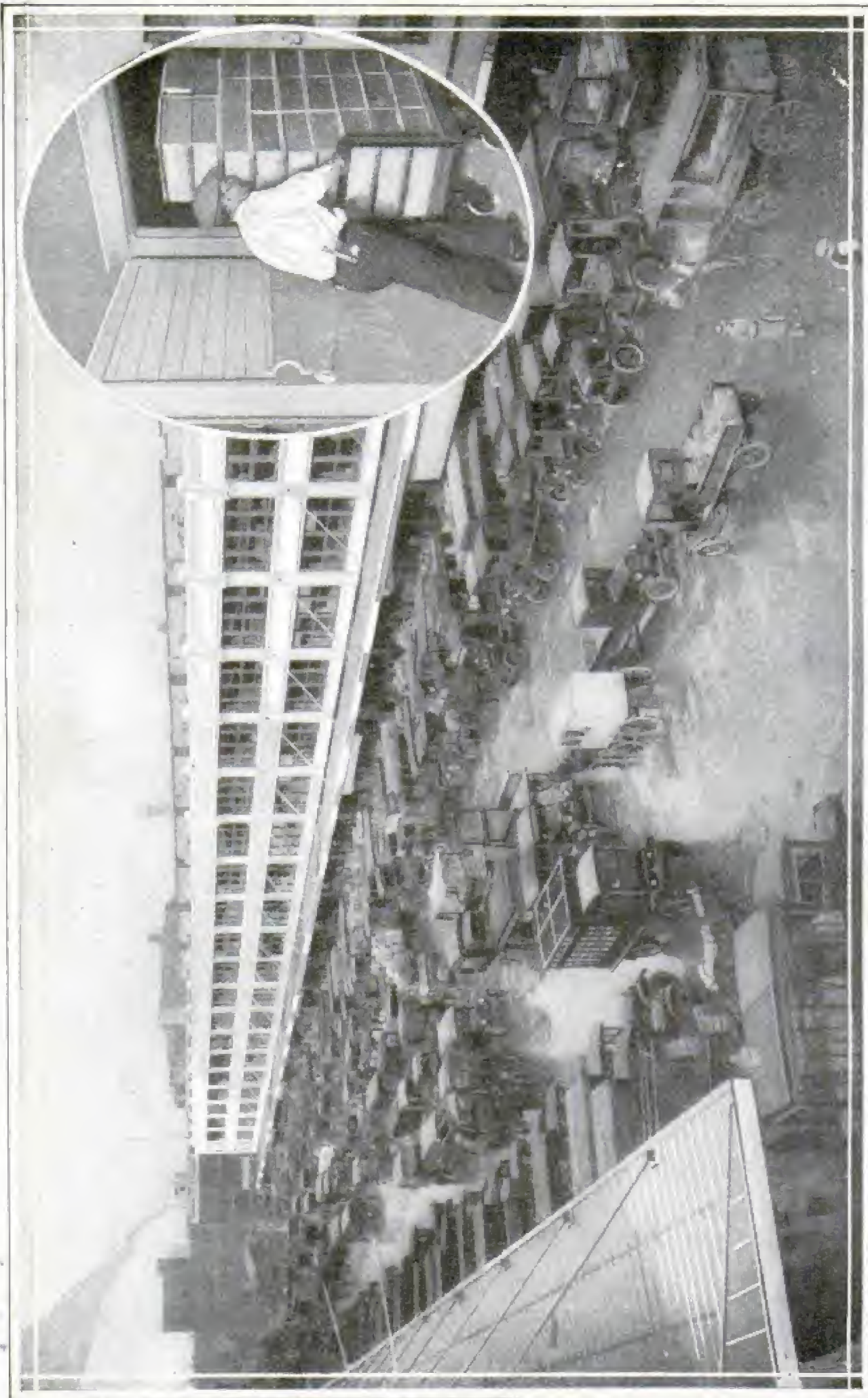
It consists of an inner socket into which the wires to be connected are inserted after being twisted together. A screw is then placed in the jacket to hold the wires in place and a fiber cover

slipped over it and the rest of the connector to provide insulation. The device is made in only one size and has a capacity of from

two to eight stranded wires. It is handy for emergency jobs about the house.

*A. S. Snodgrass
U. S. Bureau of Entomology*

*The Hattam Mfg. Co.
New Haven, Conn.*



One of the Six Blocks in the New South Water Market, Where Chicago Produce Dealers Handle All the Perishable Food Supplies for a Great City; Insert, Wheeling California Fruit into the Refrigeration Room of One of the Cement-and-Tile Store Units



Feeding a City of Three Million People

Every State Contributes the Fruit and Vegetables, Poultry, Butter, Eggs and Cheese Handled in World's Biggest Produce Market

HOW much garlic will it take to satisfy the appetite of the garlic eaters in a city of 3,000,000 people? The produce merchants of South Water street, who still retain the name of Chicago's historic market center though they have recently moved into a new \$17,000,000 home some miles away, can tell you after one glance at their annual records.

The answer is twenty-seven carloads, or at least it was in 1924, and if you ask, they will give the additional information that California contributed twenty-four carloads, Louisiana two and Illinois one.

Twenty-seven huge railroad cars filled with the

odorous bulb is enough to stagger the imagination, but that item was only a drop in the bucket in a produce-distributing center that handles a hundred thousand carloads of

fruits and vegetables every year, along with 88,464,594 pounds of dressed poultry, 258,061,395 pounds of butter, 130,022,710 pounds of cheese and 4,679,295 cases of eggs.

The grand total is what Chicago ate in one year, and includes the perishable foods only, as South Water street does not deal in canned foods, nor does it handle any meat except poultry.

To clear the way for a new double-decked boulevard, and to get out of a



Sunny Italy Is Well Represented among the Commission Men, Particularly Those Handling Fruits

506 row of ramshackle old buildings that dated from just after the Chicago fire, the 166 produce dealers of this, the world's biggest produce market, built themselves their new seventeen-million-dollar home, which covers six city blocks and has railroad connections at the back-doors, eliminating a tremendous amount of unnecessary trucking.

Every store unit is fireproof and sanitary, made so by concrete-and-tile construction. They are equipped with vast refrigerating plants for the perishable goods, and heated rooms for the delicate fresh fruits and vegetables brought from southern states in winter. The streets between the buildings are wide, to



Samples of All the Smaller Vegetables and Table Delicacies Are on Display While the Dealer Exhibits a Box of Fresh Mushrooms; Insert, Stacking Western Grapes on the Sidewalk

handle the press of trucks and wagons which call each day from thousands of grocery stores and fruit dealers.

As famous in its way as Wall street or LaSalle street in the financial world, this unique food center started more than a hundred years ago with a trading post on the banks of the Chicago river, where the settlers exchanged their goods for supplies, principally game, brought in by friendly Indians. Until the move a short time ago to its new home, the entire pro-

duce business of the city had centered ever since in the street along the river.

From a trading post for Indians it grew until, in recent years, the annual turnover has reached half a billion dollars, putting it second to "Packingtown" among the city's industries.

In the early days the commission men of the street dealt in everything from hay and hides to vegetables and flour, and in winter, when there were no fresh fruits and vegetables arriving from warmer



Poultry Is Plucked and Dressed in Wholesale Quantities for Each Day's Market



Chickens Are Shipped Alive in Special Cars. Fattened and Killed as Needed

climes, as they do now, the street turned to meat, and invited the farmers for miles around to kill their hogs and send them in.

The versatile dealer in everything disappeared long ago, and in recent years each of the 166 commission houses has specialized in its own lines. The grocer's buyer gets his cases of oranges and lemons from California and grapefruit from Florida at one store, moves on and gets a supply of dressed poultry, butter and eggs from another, stops at a third for some cheese, and calls at a vegetable house for artichokes, asparagus, beans, brussels sprouts, cauliflower, carrots, cucumbers and other supplies. Another firm will contribute cantaloupes and perhaps some fresh fruits or berries in season, and so on, until the day's supplies for the store have been collected. Less than a hundred dollars will cover the cost of a

each year goes back to the farmers scattered through every one of the forty-eight states. Some of the items come from only one or two states, and others from several. California is the sole source of the thirty-three carloads of apricots, required to satisfy the city's annual appetite, while thirty-seven states, ranging from New England on the east to Montana, Idaho and Wyoming on the west, contribute toward the more than 130,000,000 pounds of cheese. California, again, sent a thousand and one carloads of lemons in 1924, but with four cars of potatoes was only one of thirty-five states contributing toward the 22,356 carloads consumed. Wisconsin alone supplied more than 7,000 of those cars, and Minnesota ran second with nearly 5,000 carloads.

Washington led the apple-growing states, contributing more than 3,600 of the



In Fair Weather the Entire Store Fronts Roll Back

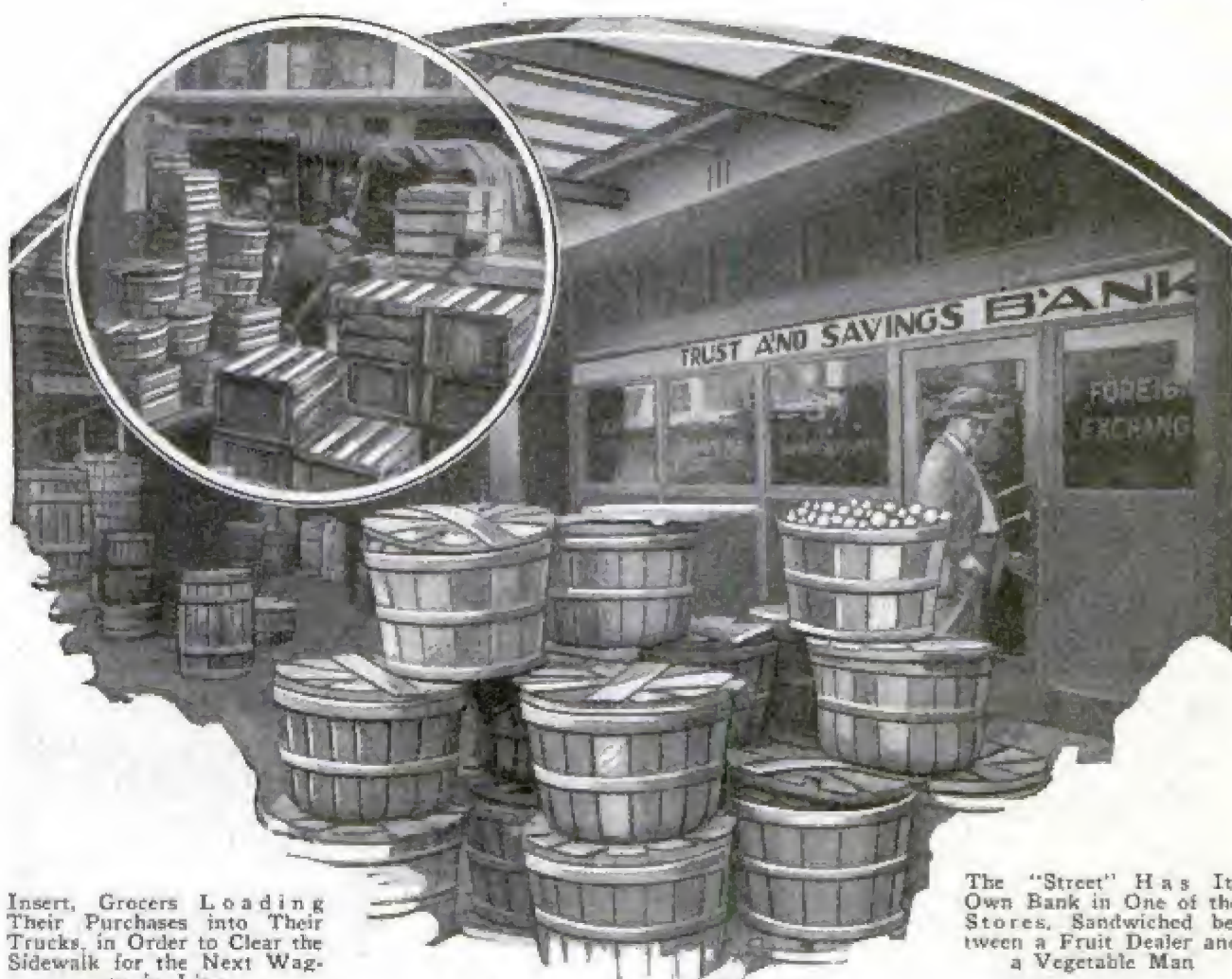
wagonload for the average grocer, but the total purchases of the thousands of city stores in a year will exceed \$500,000,000.

The vast sum this single city spends for food



Sidewalks, under the Canopy, Are Clogged with Boxes

9,242 cars received. Three states sent 177 carloads of asparagus, while California again stood alone as contributor of ninety cars of artichokes. The progress of the



Insert, Grocers Loading Their Purchases into Their Trucks, in Order to Clear the Sidewalk for the Next Wagon in Line

The "Street" Has Its Own Bank in One of the Stores, Sandwiched between a Fruit Dealer and a Vegetable Man

seasons can be watched by the arriving cars of some of the year-around staples. Florida, Mississippi, Alabama, Louisiana, Texas and California send in the first beans of the year; then, as spring advances, Arkansas and North Carolina arrivals appear, to be followed by Illinois, Missouri and Maryland. These eleven states raised 109 cars of wax and green beans for the people of Chicago in 1924.

The summer berry crop is spread over much of the middle west, and stretches into other sections. Wisconsin and Michigan contributed twenty-six cars of blueberries, while Michigan, Arkansas, Tennessee and North Carolina gave twenty-eight cars of blackberries. Two states sold twelve carloads of currants to South Water street; twenty-three states sent 2,675 cars of peaches; some of the same sections supplied 1,574 cars of pears, and others, including many in the south, grew 2,356 cars of strawberries for this one city.

The street handles just fifty-seven varieties of produce, starting with the "A" of apples and ending at "W" with 3,100 carloads of watermelons. A study of the complete list, by states, is a lesson in the geographical distribution of American

agriculture. Where do the gooseberries for gooseberry pie come from? A glance at the list shows Michigan was the sole state of origin of the fourteen carloads used in one year. The figures, however, do not show how many pies fourteen cars of berries would make, but the answer, in the words of one gooseberry dealer, is "plenty."

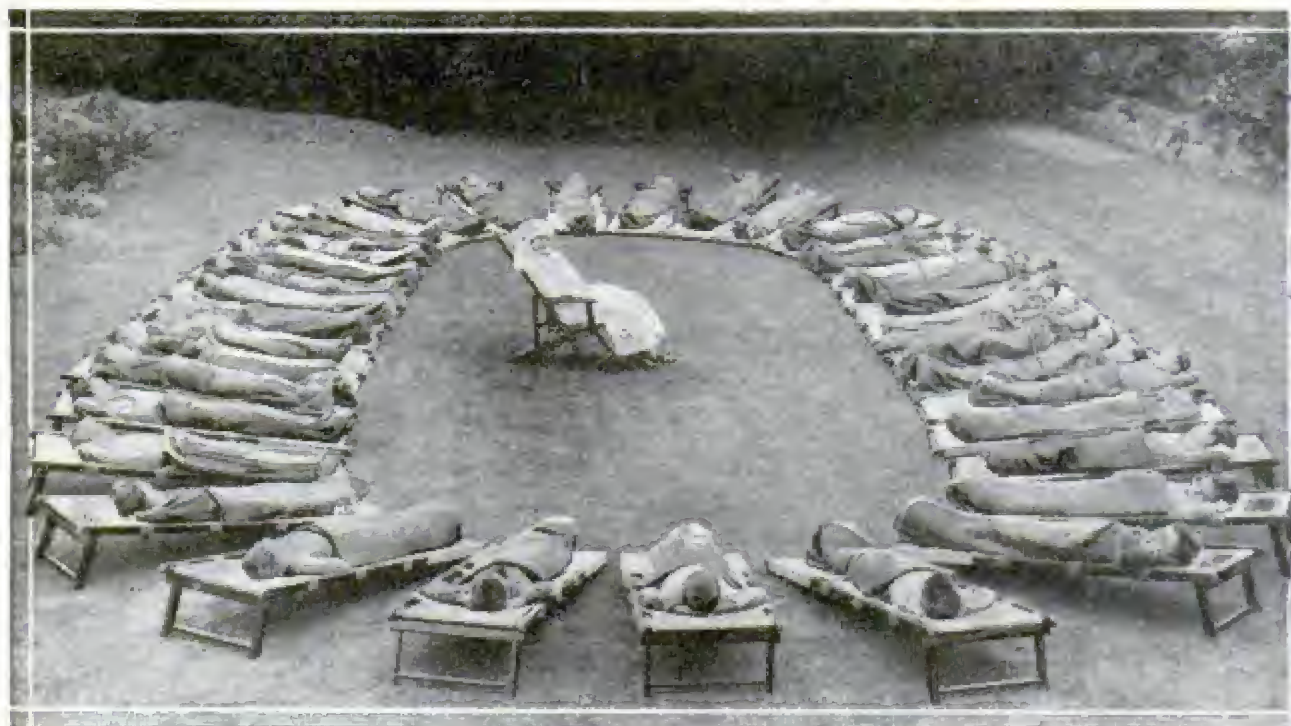
Some states contribute to more than half of the fifty-seven different kinds of food. Illinois alone supplies portions of the supplies of thirty-three different articles. New York produces twenty-three, and California, which leads because of its citrus and other fruits, contributes forty different articles.

WATERPROOF SANDPAPER

Waterproof sandpaper, now on the market, permits use of the abrasive under damp or even wet conditions, and prevents raising dust when cleaning painted, varnished or enameled surfaces. Both sides have been treated and the gritty material does not readily come off so that the paper is said to last ten times as long as the ordinary product.

Compressed Air - Aug 1920

Manning Abrasive Co., Troy, N.Y.



A "Circle of Health" to Cure Lung and Throat Ills; Children Taking Fresh-Air Treatment Enjoy Rest Periods on Special Cots That Protect Them from Dampness

CHILDREN'S CIRCLE OF HEALTH —RELIEVES CITY ILLS

Fresh-air treatment has been found beneficial to London children who are exposed to its fog-laden atmosphere, and one of the aids to the health authorities is a special type of cot upon which the patients can recline out of doors while resting and, at the same time, be protected from cold and dampness. The beds are easily set up or taken down, strong and comfortable, and prevent exposure to moist grass or earth. By arranging a number of the cots in a circle, a single nurse can watch over many children at a time. They are taught uniform methods of reclining and the best positions to assume, as an additional aid to health.

BLACKSMITH SHOPS STILL BUSY DESPITE THE AUTOMOBILE

Although the clang of the anvil has been dulled by the exhaust of the motor, blacksmiths in this and foreign countries still do a thriving business. There are 175,000 men in the occupation in the United States today, according to statistics gathered on the industry. The total yearly output of horseshoes is estimated at 1,250,000 hundred-pound kegs. A peak year was registered in 1918, when the product was valued at \$12,000,000, due largely to the demand occasioned by the World War. Approximately 17,000,000 mules and horses are employed in agricul-

tural work in the United States and many of these need the blacksmith's attention. The industry has been known for more than 2,500 years and the methods of horse-shoeing have not changed greatly since the days of the early settlers and of Longfellow's "Village Smithy."

434 LEVER BATTERY-POST CUTTER LEAVES STRAIGHT EDGE



Fitted with long arms and toggle action so that strong leverage may be developed, a battery-post cutter shaves off the lead flush with the hood plate. It has interchangeable knives and after the cutting is done, leaves a straight, smooth edge.

609

LEVEL WITH CONSTANT BUBBLE —AIDS ACCURATE SURVEYS

Changes in temperature, affecting the length of the air bubble in the spirit level on a surveying instrument, sometimes interfere with accurate observations. This difficulty is reported to have been overcome in a level with a tube so shaped that only the cross-sectional area of the bubble is affected, the length remaining unaltered.

Battery Equipment Ltd., Cleveland, Ohio.

Reliable Parts mfg. Co. Prospect av. 2819

From Harry's League, N.Y.C.

Chicago Evening Post 4/12/25

E. R. Watts & Son, Ltd. 101 Camberwell Road

WHY SEA IS BLUE 604

Small particles of salt in the sea explain why the ocean often appears to be a deeper shade of blue than fresh water, according to one theory. The color deepens according to the depth of the water and the amount of salt. For instance, the Mediterranean, noted for its beauty, is rich in the mineral and the Pacific ocean sometimes appears dark enough to be called indigo. Stretches of white sand below shallows near shores cause the blue to change to different shades of green or gray, and myriads of minute organisms in some parts of the seas affect their color. Blue is the fundamental color of water, although it cannot be detected in small quantities of the liquid. The sky's color is believed to be due to minute particles of dust in the air and the way in which the sunlight is reflected by them.

SHOE FITTER MEASURES FOOT AND STAMPS SIZE ON CARD 519

Measurements of the foot are taken quickly and accurately on a shoe-fitting apparatus to help the salesman pick out



Instrument Records Dimensions of Foot on Blank

the right size for the customer without the bother of a number of trials. On a card inserted below the rest for the foot, numbers are automatically stamped, indicating the dimensions of the sole.

Used in shops in



Sliding Ring Anchor to Which Worker's Belt Is Buckled as Safety Precaution While Painting Pipe

LIFE BELTS PROTECT PAINTERS FROM SERIOUS FALLS 570

Painters and other workmen at a large manufacturing plant who are required to climb to perilous positions, are guarded by specially constructed life belts about the waist and attached to the structure on which they are engaged. In painting a large horizontal pipe, the life lines were connected to a ring encircling the conduit, so that it could be moved along as the work progressed. Even the paint pail had its "life line" to prevent danger to those below. Similar equipment was used by men on a scaffold to provide a safeguard if the rope falls should break.

SUN LOSES FOUR MILLION TONS IN WEIGHT EVERY SECOND 536

According to estimates made by Sir Oliver Lodge, the sun loses 4,000,000 tons in weight every time the clock ticks. The scientist declares that this should occasion no alarm, however, for the sun can go on reducing at this rate for hundreds of years and still furnish the earth heat and light. The loss is represented in burning gases, the nature of which is to be studied further when an eclipse occurs.

Talk before British



The Gay Lion Farm and a Porcelain Statue of "Numa," Which Guards the Entrance; in Center Is a Group of Sixteen of the Fully Grown and Trained Beasts in a Corner of the Wire-Net Inclosed Yard in Which They Live, Instead of Being Caged in Separate Homes; Below, Mrs. Charles Gay and Three of the Cubs; Notice the Kittenlike Posture of the One Lying On Its Back; There Is a Growing Demand for Small Lion Cubs among People Who Want Unusual Pets





Mr. and Mrs. Charles Gay and a Group of Their Lion Cubs

Home-Grown Lions on California Farm

Eighty Animals, Raised on Goat's Milk and Trained without Whips, Gambol in Movies as Playmates of Actors

By FRED GILMAN JOPP

A FIVE-ACRE lion farm, with an annual profit per acre from each year's crop that would astonish more prosaic farmers, has, in the last six years, grown up as one of America's strangest business ventures.

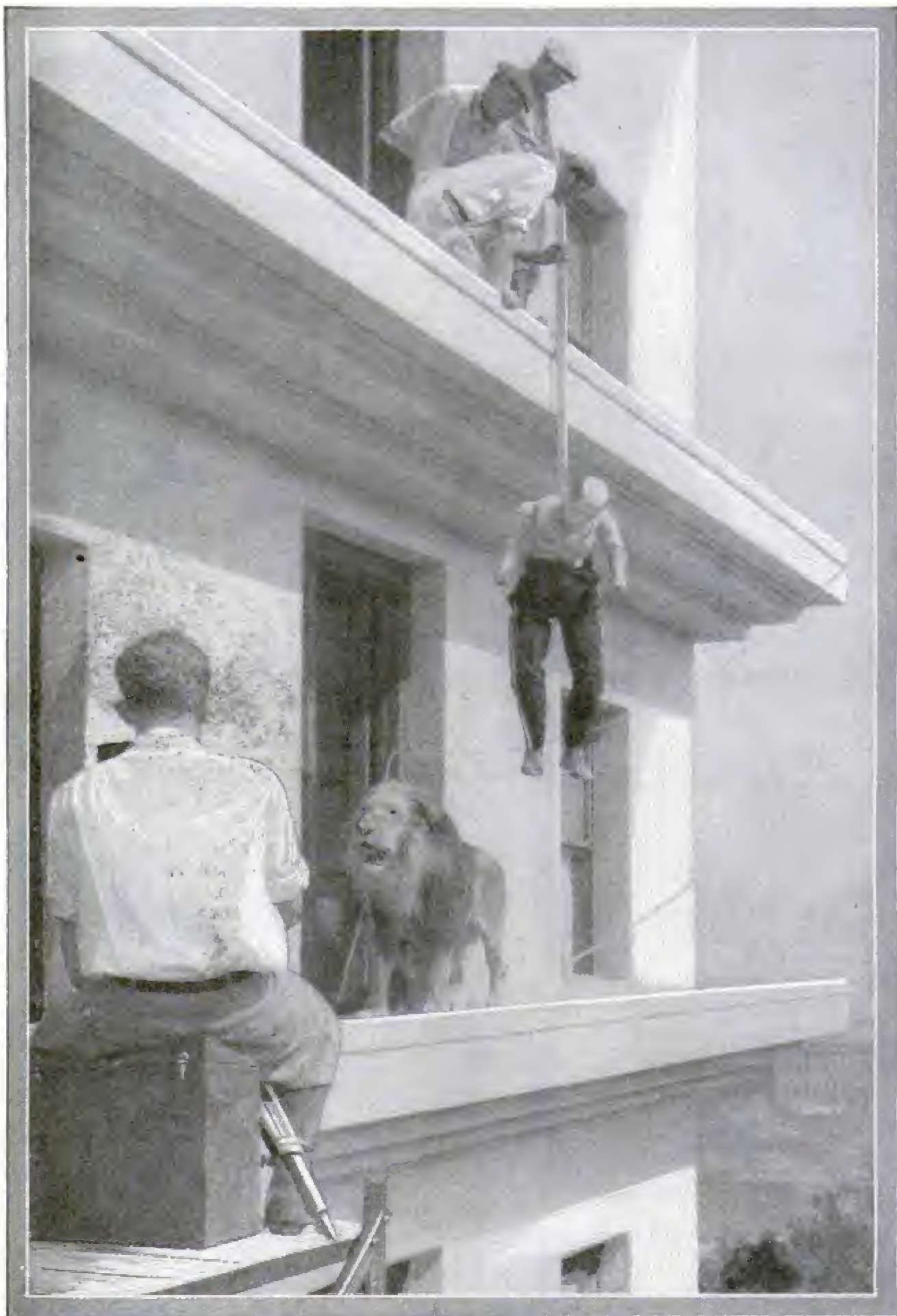
Starting with a lion and two lionesses a half dozen years ago, Charles Gay, the world's only lion farmer, has run his shoe-string into a \$100,000 plant, a stock of eighty animals in addition to many which have been sold outright, and a business that pays a comfortable small fortune every year. A few years ago, he landed in Los Angeles with his wife, and ten dollars in his pocket, his only other asset a decade as an animal trainer in the Bostock troupe in Europe.

Today his lions are performing regularly in most of the movie studios of Hollywood, or in the imitation African jungle which he has planted on his farm. Each lion used in a picture draws a salary of \$50 a day. In addition to this income, surplus stock is sold each year

to zoos, circuses and stage performers, while hundreds of visitors daily pay admission to the farm to see more lions than eight or ten large zoos could boast.

The success of the Gay lions as performers is due to his unique training methods. The animals are as tame as kittens, even when full-grown and, under Gay's direction, can be handled by the most inexperienced movie actor without danger. They have never known a whip, prodding iron or blank cartridge, so are without fear of man. In their training, Gay uses a little switch, twelve inches long, and when he enters a cage full of the beasts there are no attendants outside with other weapons to protect him.

In addition to the professional market, there is a growing demand for cubs as pets. A cub at birth is valued at \$350, so the pet market alone offers a good income for a farm which produces scores of cubs every year. Gay estimates the entire lion market of the United States can absorb 200 animals a year, and it is his ambition



Playing "Opposite" the Studio Dummy, the Well-Trained Lion Actor, like His Human Companions of the Screen, Faces the Camera for a Close-Up, Unmindful of the Perils of a High Cornice

to supply it with tame farm-raised pets, eliminating the importation of half-savage beasts trapped in Africa. Full-grown and trained lions bring from \$30,000 to \$50,000, and a trained lioness, lacking the noble head and vast mane of her mate, not quite so much. "Numa," king of the Gay lions, is valued at \$50,000 and is much in demand with photographers and painters as the most perfect lion in America.

There are no iron-barred cages on the lion farm. Instead, all the animals live in the open, roaming around in large screened inclosures. Heavy posts support the strongest wire netting, the bottom edge of which runs underground and is turned in for several feet to discourage digging out. Bordering the arenas, low stucco houses, divided into individual compartments, one for each lion, provide shelter. One arena is given over to the fully grown and trained animals, a second to the "high-school gang" of half-grown beasts, and a third is alive with a squirming, rollicking mass of cubs.

Each animal, from birth, has his own name, and for Mr. and Mrs. Gay his own peculiarities. "Numa"

Gay Taking a Ride on a Full-Grown Lion and an Actor Supporting Part of "Numa's" 600 Pounds



and some of the other patriarchs of the group are aloof, calm, sedate and dignified. "Pluto" and "Vanredi," the friendliest of the lot, are lively and playful. "Pluto," with his big paws well padded, is an expert at wrestling and boxing with his trainer. At three years of

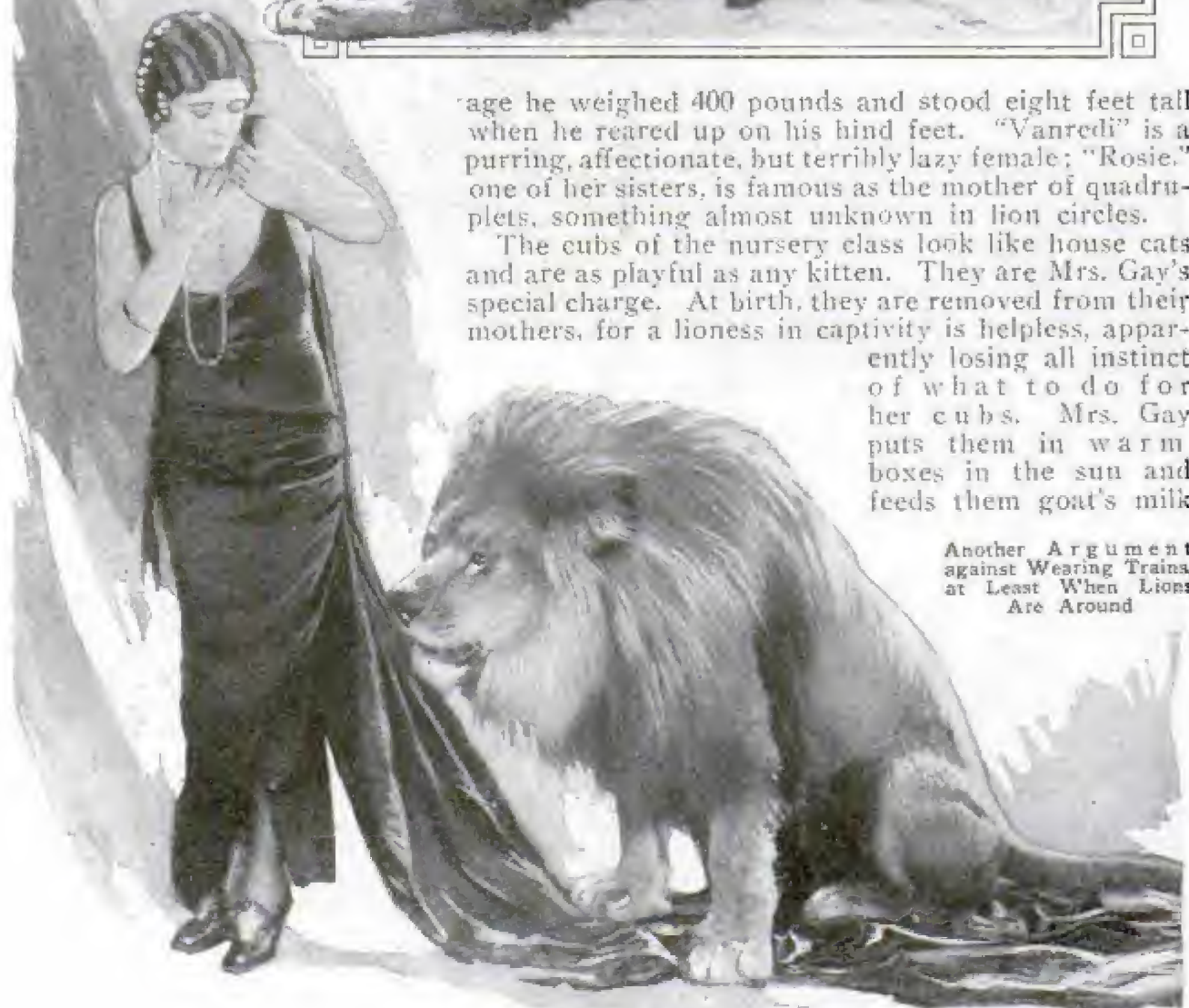
Gay Putting Two of His Big Performers through Their Paces in Drill



age he weighed 400 pounds and stood eight feet tall when he reared up on his hind feet. "Vanredi" is a purring, affectionate, but terribly lazy female; "Rosie," one of her sisters, is famous as the mother of quadruplets, something almost unknown in lion circles.

The cubs of the nursery class look like house cats and are as playful as any kitten. They are Mrs. Gay's special charge. At birth, they are removed from their mothers, for a lioness in captivity is helpless, apparently losing all instinct of what to do for her cubs. Mrs. Gay puts them in warm boxes in the sun and feeds them goat's milk

Another Argument against Wearing Trains, at Least When Lions Are Around



from a bottle three times a day. Later fresh eggs are added to the diet at frequent intervals.

As soon as the cubs are big enough to be weaned, they are turned over to Gay in the high-school arena and go on a meat diet, getting one meal a day.

Feeding a farm crowded with lions is an expensive task. A full-grown beast gets fifteen pounds of horse meat daily, which means that a new animal must be butchered each afternoon. The meat is served warm and fresh, whereas zoos and circuses with fewer animals are forced to use chilled beef, and store it in a warm place for several hours before feeding in order to remove the chill.

On the movie lot the animals are constantly surrounded by crowds of players, who pet them without fear. However, this foreign petting is the owner's chief worry, for, like a dog, a



"Caesar," a Baby Lion, Visits the Doctor to Have a Splinter Removed from Its Paw

lion will stand just so much handling and no more. As soon as the beast shows signs of growing tired of performing, he goes back into his transfer cage and is returned to the farm for the day. They are never handled for two hours before and after eating.



"Pluto," Eight Feet High and a Trained Wrestler, Takes on Gay for a Bout

CHILDREN GUARDED ON STREETS BY LOWERING SAFETY GATE

AMERICAN RUSH IS CRAWL CITY SURVEY SHOWS

Children have the right of way at times, while going to and from a school in

The pace of American cities is more of a crawl than a rush, if travel conditions in



Striped Crossing Gate, like Those at Railroads, Is Lowered to Halt Autos, Insuring School Children's Safety

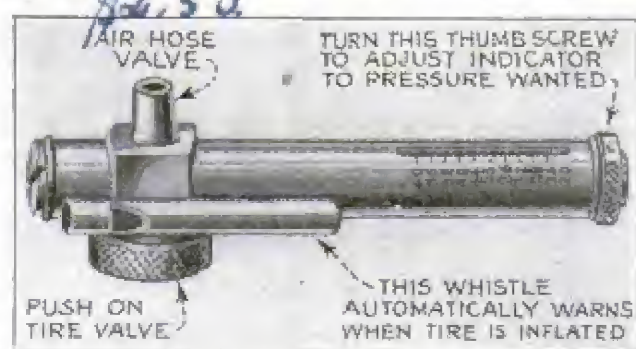
Washington, D. C., are typical of those in other centers. On the basis of 90,000 replies to a transportation-survey questionnaire, it was found that the pedestrian whose daily trips between his home and office are two miles or less, averages 3.7 miles an hour; street-car riders, 4.1 miles; motorbus patrons, 4.5 miles, and an automobile passenger, 5.7 miles. On journeys of two to six miles, 7.2 miles an hour was the average for street-car patrons, 7.5 miles for bus passengers,

Evanston, Ill., for automobiles are halted by gates similar to those used at railway crossings, permitting the pupils to reach the other side in safety. Juvenile traffic officers formerly were stationed at the intersections, but their signals were little heeded by motorists.

while 10.6 miles an hour was made by the private-automobile user. The survey also showed that the regular rider who uses the street car and pays in tokens at less than the cash fare, pays the companies 2.44 cents for each mile traveled; regular bus patrons 3.66 cents per passenger-mile, and the taxi rate is 23.9 cents for each passenger-mile. On the basis of an average load of 1.9 passengers, the cost of driving a private automobile is estimated at 5.85 cents per passenger-mile. Data relative to the amount of street space required showed that the private auto, on the basis of an average load, takes up forty-six square feet for each passenger as against ten square feet for each passenger on the street cars. In rush hours, the automobile requires fifty-one square feet

WHISTLING AUTO-TIRE GAUGE PREVENTS OVERINFLATION

Danger of overinflating auto tires is practically eliminated by using an automatic air gauge now on the market. Before attaching it, the motorist adjusts a thumbscrew indicator to the pressure desired. The instrument is then connected by inserting the tire valve into an opening in one side of the gauge and the hose into an aperture on the other side. When the required pressure is reached, the supply is automatically cut off from the tire and passes out through an "exhaust" valve while a little whistle blows to inform the user that the tire is properly inflated. The gauge is less than four inches long and is manufactured in two styles, one for balloon and the other for the ordinary high-pressure tires.



Safety Tire-Gauge Which Prevents Overinflation by Automatically Shutting Off Excess Air

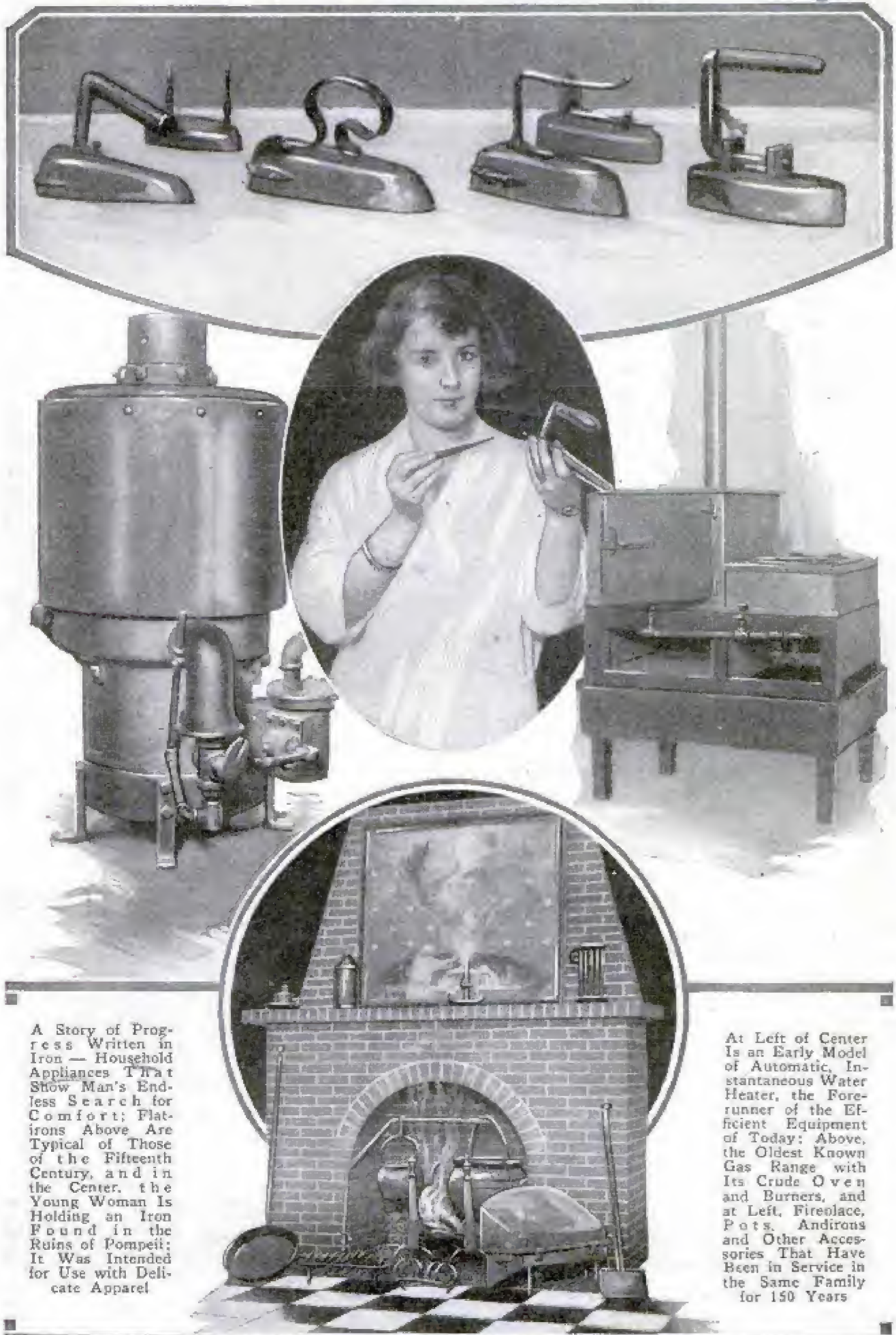
of space to each occupant, as compared to seven for each street-car passenger. This difference is caused by the fact that autos carry fewer passengers during the busy hours, on the average, than the street cars. Although automobile owners were given previous warning that the count was to be taken, it was found that of the 85,000 registered cars, 18,000 were parked on the streets overnight.

Chicago agents Mr. Lloyd / 1003 Glenview
Mr. Shaner / Parkman

Chrysler Motor Products Co.,
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Evanston, Ill.
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625

Public Attention
Compared to
Columbia

552 Exhibited by Consolidated
 Gas Co., New York City
 How We Have Advanced Shown at Exhibit



A Story of Progress Written in Iron — Household Appliances That Show Man's Endless Search for Comfort; Flatirons Above Are Typical of Those of the Fifteenth Century, and in the Center, the Young Woman Is Holding an Iron Found in the Ruins of Pompeii; It Was Intended for Use with Delicate Apparel

At Left of Center Is an Early Model of Automatic, Instantaneous Water Heater, the Forerunner of the Efficient Equipment of Today; Above, the Oldest Known Gas Range with Its Crude Oven and Burners, and at Left, Fireplace, Pots, Andirons and Other Accessories That Have Been in Service in the Same Family for 150 Years

LAWN TRIMMER CUTS EDGES SAVING USE OF SHEARS

530 Owners of lawns are spared the task of trimming edges with shears or sickles by



Trimmer in Side and Rear Views and in Use Flush against a Wall

a mower that is like the ordinary kind cut in two. It can be run close against the sides of buildings, and not only cuts the grass, but slices the sod, evens up margins and cleans edges with a sharp disk that can be raised out of the way while cutting. Below the disk, is a little plowshare to throw material aside. The trimmer is similar to a full-size mower, having a four-knife cylinder.

HOW HIGH DO BIRDS FLY?

By applying methods of the astronomer, a German scientist has established reliable figures as to the height at which migrating birds fly. Formerly, many bird students believed that such elevations as 35,000 feet were not uncommon, but it is now practically acknowledged that the average height is only about 350 feet. The observer watches until he sees a flock of birds in flight across the face of the full moon. If he recognizes the species and knows their size, it is a simple matter of calculation to estimate closely their height by using the moon as a sort of scale. He has discovered thrushes flying at about 600 feet, starlings at 2,400 feet and lapwings at 2,200. The greatest height ob-

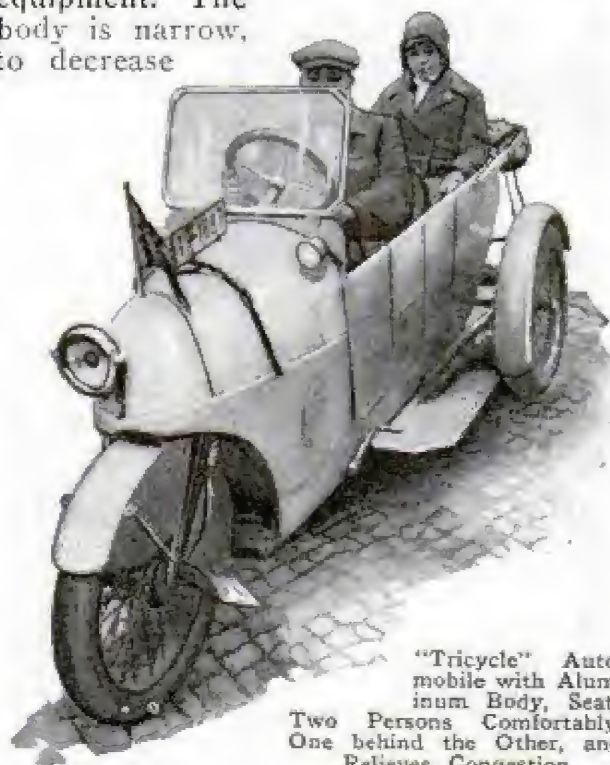
served was 4,900 feet, but in this case the birds could not be identified. Assuming an average for their actual size, their apparent size as seen against a moon crater, gave the data for calculating the height.

BLIND MAN, GUIDED BY FINGERS, BUILDS OWN HOUSE

Although handicapped by blindness, Francis A. Burdett of Wayne, N. J., sixty-three years old, has built his own two-story house. His sensitive fingers served as his eyes to help him measure boards and timbers and fit them into place. The home is the second he has constructed. Three years ago he built a two-room bungalow, doing all the work himself and completing it in two months. He was a watchmaker by profession when an accident caused his blindness. He taught himself how to make crates and boxes and later applied his skill to home building.

AUTO WITH THREE WHEELS SEATS TWO PERSONS

Among the many types of small cars used in Europe, a three-wheeled auto with an all-aluminum body introduced in Berlin, carries two persons, one seated behind the other. Windshield, top, and adjustable headlight like those of the ordinary automobile are included in the equipment. The body is narrow, to decrease



"Tricycle" Automobile with Aluminum Body, Seats Two Persons Comfortably, One behind the Other, and Relieves Congestion

the amount of wind resistance, and a wide mudguard behind the front wheel protects the sides of the car.

no data. p.s.a.

1/10/25
Cosmos May 1925

White, Pmb, Ledger
10/4/25



© Henry Miller News Service

Stunt Man Leaping from Boat to Ladder of Airplane Going Eighty Miles an Hour; Later He Tried to Drop Back upon the Boat with a Parachute but Missed

LEAPS FROM BOAT TO AIRPLANE AT EIGHTY MILES AN HOUR

Teamwork and skill were required for the successful leap of a daring "stunt man" from a fast motorboat to an airplane. The boat was going sixty miles an hour when the plane, flying twenty miles an hour faster and with a ladder dangling, swooped down so the climber could catch on. The connection was made without mishap, and when the plane had ascended 1,800 feet, the man on the ladder attempted to leap back to the boat with a parachute. His calculations and those of the aviator and the hydroplane operator were so nearly correct that he missed his objective by but a few feet.

EXPERT GOLFER TEES OFF FROM GIRL'S HEAD

Standing 273 feet above the street on the twenty-fourth-floor level of a Chicago office building, a professional golfer made a drive of 781 yards. Besides this

stunt, the player demonstrated his skill by driving woolen balls from a cardboard tee placed on the foreheads of assistants, one of whom was a girl.

RADIO DEVELOPS A DETECTIVE TO LOCATE INTERFERENCE

The radio industry has given birth to a special kind of detective, a sleuth not concerned with evidence relating to crimes but to causes of interference, such as doorbells, battery chargers, X-ray and violet-ray machines and leaky power lines. His equipment consists of nothing more than a coil or loop antenna that revolves, and a radio-receiving set of a portable, rugged type. With his outfit conveniently installed in an automobile, he can make wide surveys about his neighborhood, seeking the source of the trouble. Once it is located, correction is sought by co-operation between the owner or owners of the disturbing elements and the radio users.



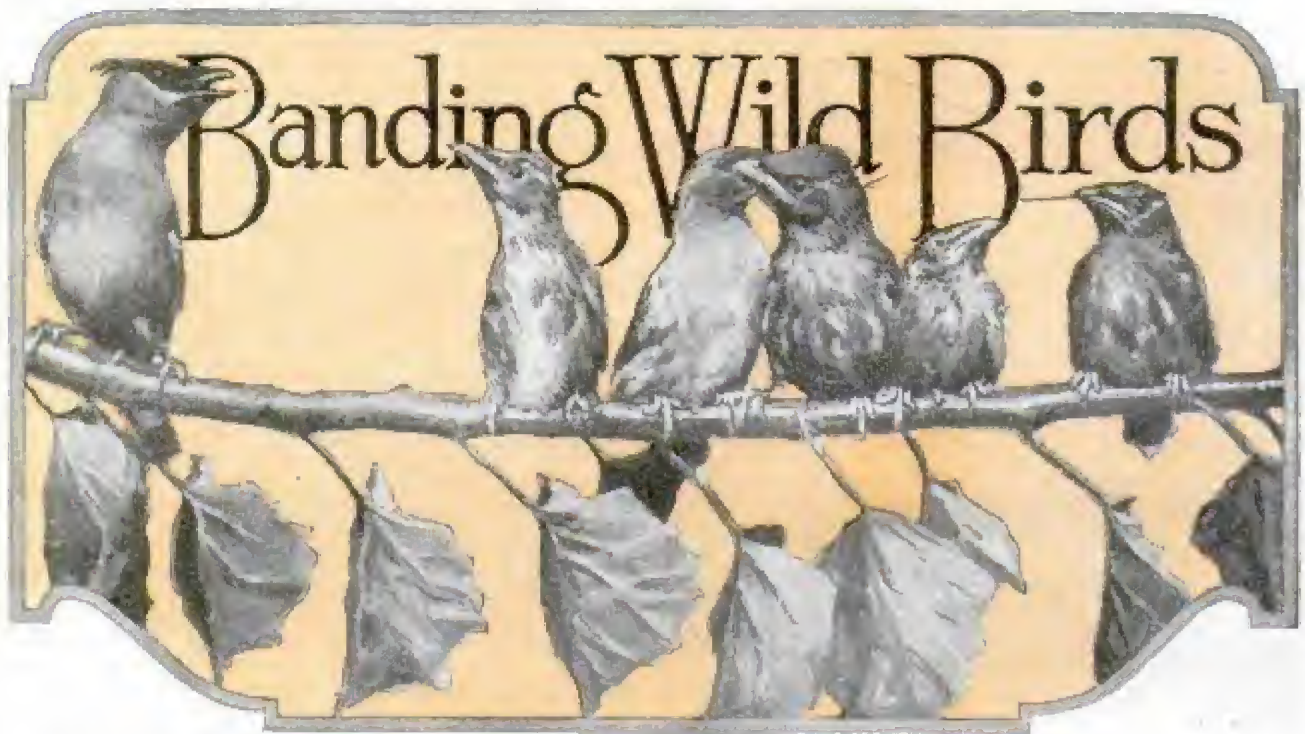
© Harris & Ewing

Seeking Source of Interference, a Radio Detective on the Job with His Equipment

Jack Redmond, 24th floor

528.

Crab. S. O. Winters. Electrical National Radio Club. Chicago. Ill.



More than 100,000 Already Have Been Tagged with Leg Labels Then Released to Trace Their Travels

By HARLAN H. EDWARDS, *Altadena, Calif.*

MANY interesting and hitherto unknown facts about the life, habits and travels of wild birds are being established by means of bird banding. This work, authorized by federal and state permits, is being carried on throughout the United States and Canada in co-operation with the biological survey.

Birds are captured for banding purposes in various kinds of traps, all of which, however, effect the harmless imprisonment of the bird until it can be removed. It is then examined, and a tiny aluminum band, or bracelet, placed loosely on one leg, after which it is released. Each of these little bands bears a serial number, which is registered in Washington together with a description of the bird. Every time a bird so numbered is retaken, a record is made, thus adding another chapter to its known history. Although this work has gone on for comparatively few years, over 100,000 birds already have been banded and the number is increasing by leaps and bounds.

Places where trapping and banding operations are carried on soon seem to become known to the birds as sanctuaries, so that the population rapidly increases, as compared to the surrounding territory. In this way, time and energy spent in this work by bird lovers are amply repaid. By banding, one can keep almost daily record of many of the birds inhabiting the local-

ity, while during migration, one may discover the day an individual bird comes and the day it moves on.

The birds display no fear of the trap. They often seem to regard it as a special feeding table and some birds form the "trap habit," entering it several times a day. In fact, one station in Georgia reported a brown thrasher as spending most of every day in the trap, while a cardinal became such a nuisance by getting into the trap and keeping other birds away that finally it was found necessary to move it to another location.

Many interesting instances might be given of the actions of the wild birds while being banded. In spring, they often sing their song immediately upon being released. One worker reported a bird as regularly singing while held in his hand. Some birds grasp one's hand with their beak, others with their claws, and some "play possum," but with their eyes open.

This tendency of the birds to remain motionless in the hand, although entirely unrestrained, is of interest. If one releases birds by very gently opening the hand, many of them remain deliberately until they have entirely recovered from their first little scare, before taking wing. Sometimes they stay until the hand grows tired.

There are many things to be learned from the data obtained by banding, the evidence gathered becoming more and



Grosbeak and Myrtle Warbler Family Above; Center, Calaveras Warbler "Playing Possum"; Below, Blackbird at Nest and Golden-Winged Warbler



more valuable as the number of birds banded and recovered increases. It has been proved that certain species of birds return yearly to the same locality for nesting and for the winter seasons. Migrating birds stop at the same feeding places en route year after year. By additional returns, answers to the following questions are expected to be obtained. How long do birds live? Do migrating birds travel each day or linger at places en route where feed is good and the weather suitable? Do they move on ahead of or after storms? How far do birds wander in their daily feeding? If birds do return to the same nesting place year after year, will they use the same nest and have the same mate? After the young birds leave the nest, do they stay in the same locality? Do birds raise a second brood in the same nest or near by? Do young birds return to the same place another season? What are the routes and speed of migration of the various birds?

Definite data bearing on these questions are already being obtained. Each year adds to the number of banded birds which are at large, and also produces multiplying records of birds which have returned to stations at which they were first banded. Reports are being constantly received con-

cerning banded game birds which have been killed at various points, all, when analyzed, of interest.

By ascertaining migration routes, especially of game birds, preserves can be established at various points to afford the birds protection while traveling to and from their nesting grounds in the far north country. That some action must be taken in the near future to prevent extinction of our game birds is becoming more apparent, as can be attested by the increasing scarcity of birds at various hunting grounds. Some birds, once abundant, the passenger pigeon, Eskimo curlew, etc., are already extinct. Others, the prairie chicken, whooping crane, trumpeter swan, and some of the ducks and geese, are so reduced in numbers that their extinction seems imminent.

Among the many interesting migration records already established are those of a number of ducks banded at Browning, Ill., while in migration. From the bands returned, many of the birds traveled as far north as central Manitoba and Saskatchewan, others as far south as the Texas and Louisiana coast, while a few stragglers got as far east as the Atlantic ocean. Among the longest recorded distances traveled was that of a common tern which



Flock of Fulmar Petrel Following a Whaling Vessel for Scraps; by Leg Band Tracers, Much Is Being Learned of Birds More Difficult to Study

5/10
was banded at Eastern Egg Rock, Me., July 8, 1913, and was found in August, 1917, on the Niger river delta, West Africa. Another, banded at Brigantine island, N. J., in 1920, was found two years later in Paria bay, Trinidad, off the coast of Venezuela. A blue-winged teal, banded Sept. 24, 1920, at Lake Scugog, Ontario, was found Dec. 9, 1920, in the Caroni swamp, near Port of Spain, Trinidad. Black-headed gulls, banded at Rossiten in northern Germany, were recovered at the island of Barbados, W. I., and off the coast of Vera Cruz, Mexico. Perhaps the reader may be the one to find a bird bearing a tiny aluminum band on one leg, on which a number is stamped together with the abbreviations "Bi. Surv." and on the back, "Washington, D. C." This bird may have been banded in some far-off place and its recovery forms a valuable link in the chain of evidence being gathered. If such a bird is found or taken either alive or dead, the fact should be reported at once to the United States biological survey, Washington, D. C. If the bird is dead, the band and identifying parts of the bird should also be sent, together with the date and place where found, and the name and address of the person who found it. If the bird is captured unharmed, jot down the band number carefully before releasing it, and send the data with a description of the bird.



Flag of Poplar-Wood Chains and Its Carver; Links Are Colored on Both Sides and Supported by Rod

U. S. FLAG OF WOODEN CHAINS CARVED WITH KNIFE

Chains of poplar-wood links, carved with a pocketknife and colored, have been

formed into a United States flag by an Indiana craftsman who spent several years' spare time on the task. It is three feet wide and five feet long, and is tinted on both sides so that it is reversible. The chains are supported at the top on a strong metal bar.

RACING AUTOS REGISTER TIME BY RUNNING OVER HOSE

To insure greater accuracy in timing racing automobiles, a western inventor has developed a simple outfit which eliminates the human factor. It consists of a water-filled length of hose laid across the track with a plunger and lever connected to a stop watch at one end. When the car runs over the hose, water forced against the plunger actuates the lever and starts the watch. Returning from a lap around the track, the auto stops the timepiece as it recrosses the hose.

The equipment has been found especially useful for timing cars in qualifying rounds to determine positions in a race. The automobile shown in the accompanying illustration is equipped with a special type of supercharger which makes 24,000 revolutions per minute when the motor's speed is 4,000 revolutions per minute.



When Auto Runs over Hose, Plunger Starts or Halts Stop Watch on Stand

FOURTEEN MILLION OWN HOMES IN U. S., SURVEY SHOWS

Although America has been called the most extravagant country in the world, home making is one of its biggest industries, a building association's survey shows. Construction of residences constituted sixty per cent of the year's \$6,000,000,000 building program, and it is estimated that 14,000,000 American families are homeowners. Approximately \$3,000,000,000 a year is spent for automobiles, with almost as much for tobacco.

Indiana Limestone.
The Associated...

Clyde Tansley
Lipton, Ind.
Ryder Bros. Junior
Laurel Motors Corp.
Anderson, Ind.



White Tile Markers for Traffic Lines and How They Are Inserted in Wooden Blocks

TILE SET IN PAVING BLOCKS TO GUIDE TRAFFIC

Permanent lines for the guidance of traffic are provided by round pieces of white tile set in holes bored in wooden paving blocks. Although they appear as rows of white dots when seen at close range, from a distance they give the effect of a solid line. They do not wear away as does paint, so need little renewal, are easily cleaned and do not readily become dislodged.

DARK-COLORED HOUSE WARMER THAN WHITE

That the interior temperature of a house during the summer months depends to a marked extent upon the color of the outside surface, has been proved by a series of experiments. It was shown that darker colors are as much as ten

degrees warmer than lighter ones, and that most unpainted buildings will be warmer in summer than those painted white or a light tint. The tests were made with metal containers and both wood and iron panels, all painted in different colors. They were exposed on the roof of the laboratory on a day when the official air temperature was eighty-two degrees Fahrenheit. Thermometers were inserted in the ends of the specimens and regular readings taken. Wide differences were noted. For instance, the unpainted metal container showed a temperature of 102 degrees, but the black one registered 114. The interior of the white wood panel was only 104 degrees but the thermometer went to 130 in the black one. The white iron panel was twenty degrees cooler than the one without any paint. The tests were held to indicate the importance of planning color schemes for new houses, as a difference of a few degrees often represents the difference between comfort and misery.

PLANE GOES THIRTY-FIVE MILES ON GALLON OF GASOLINE

Weighing only 320 pounds, a small airplane that won the speed and efficiency tests at Mitchell field, flew thirty-five miles on one gallon of gasoline. It is estimated that it could make a trip from Chicago to New York at an expenditure of only about \$5 for gasoline and oil. The wing spread is sixteen feet and the length fourteen feet three inches. The plane can attain a speed of eighty-five miles an hour.



One Man Can Lift Tiny Airplane, as It Weighs Only 320 Pounds, But It Can Fly Eighty-Five Miles an Hour

American Builder
10/1925

Ed. O. Jerry Block.

Whitall, London
no other information.

Powell flight
plane

Syncopated Music, with the Variations Introduced by Jazz, Depends for Many Effects on the Wind Instruments



Where Jazz Comes From

Distinctive American Form of Music, an Accidental Discovery by Four Boys, Now Being Adopted into Classical Forms

By EARL CHAPIN MAY,

Sharow. Conn

AT a national convention of music industries, a piano manufacturer attacked jazz as "a series of animal howls—a yowling of jungle creatures." About the same time, several thousand lovers of music assembled to hear Eric Delamarter, internationally famous as organist, conductor and composer, interpret his complete jazz symphony with the aid of one of the largest pipe organs in the world and eighty-five members of the Philadelphia Symphony orchestra.

The debate on the question, "Resolved: That jazz is a distinctive American form of true music," waxes more violent with its increasing popularity. The violence of the debate is equaled only by the argument over its origin. As a matter of fact, the question of where jazz originated finds a parallel in that classically moot query, "Which came first, the egg or the hen?" Even the origin of the word "jazz" is in doubt, and few agree on what style or type of music shall be justly called jazz. But several years of study and practical experience lead to the conclusion that jazz is the offspring of syncopation, plus a multitude of non-musical notes and a wealth of effects by the traps and the drums, and other similar

instruments that are sounded by beating. Syncopation is the stressing or accenting of the afterbeat in music. It antedates music because the first drum corps in the wilds of Africa went in strong for syncopation. The savage who evolved a drum, by stretching dried skin across the end of a hollow log, made "drum talk" by accenting the afterbeat. The Kaffir coal miners of the Rand rally around their syncopating drum corps to this day. You'll find syncopation among the Peruvian drummers of the Andes, the Siberian drummers with their bone drumsticks, and the Tibetans who drum upon human skulls.

John Sebastian Bach, "father of modern music," was using syncopation in his "Well Tempered Clavichord" and other compositions before 1750. Ludwig Van Beethoven wrote syncopation into the Scherzo movement of his Opus 18, Number 6, before 1800. When our south imported slaves, it also imported syncopation from Africa. When the dives of the old Barbary Coast of San Francisco introduced us to the one-step and fox trot they adopted a syncopation, developed in Buenos Aires, Argentina, which came from the tribal dances of Brazil. But the



Charlie Chaplin, a Southpaw, Leading an Orchestra in One of His Own Compositions

effects by which modern jazz is identified originated in our own southland and its negroes. We first came to recognize them in the negro blues. W. C. Handy, an Alabama negro, put the blues on our musical map. Handy was proprietor and manager of a dance orchestra. One night,

more than thirty years ago, he was filling an engagement at the little town of Cleveland, Miss. Three local negroes applied for permission to interpolate a selection. This permission granted, the trio, equipped with mandolin, guitar and bass viol, played, over and over again, a mournful, primitive strain of twelve instead of the orthodox sixteen measures.

There were just three changes of harmony in this unfinished symphony, but it made a hit, partly because the guitar and mandolin players slid their fingers along the frets and produced the effects we now hear in the Hawaiian steel-stringed guitar and ukulele and partly because the bass-viol player "wolfed" his tones. White folks present showered money upon the local negroes.

Handy sat up and took notice. He studied the new type of music, which had a melody something like the negro spirituals, but encouraged encores because it left the impression that there was something more to come. One result of Handy's study was the composition which has won fame as "The Memphis Blues." It was a song without words at first, but it went big. Then Handy wrote some verses for it, referring to a Memphis election campaign. They were not so good. George Norton, a white man, contributed a new set of verses, which became permanently attached to the Handy melody,



© Keystone

A Band of Original Syncopators, the Kafir Drum Corps Gets Jazzy Results by Accenting the Afterbeat



Chaplin Directing the Phonograph Recording of His Own Compositions, Above, and a Jazz-Band Member with a Few of His Rhythmic Reeds



praising the hospitality of Memphis and the skill of Handy's orchestra.

"The Memphis Blues" traveled from coast to coast. There was an outbreak of blues in every musical quarter. The ragtime craze followed. But jazz was still unborn. It remained for four New Orleans white boys to add that word to the world's vocabulary.

Nearly twenty years ago, this quartet of youngsters did the usual kid tricks in the Crescent City. They followed the street bands. They imitated them on mouth organs and "kazoos." Presently, and somewhat blindly, the boy named La-Rocca found himself the leader of the band of four, and also the cornetist. By the same undefined process, the youth named Edwards began to master the seven positions of the slide trombone. Young Shields became "one of those grinning fools who suck a stick," in other words, a clarinetist. And young Scar-

boro became intrigued by the manifold possibilities of the traps and instruments of percussion, so often now referred to as the "battery."

Without an hour of professional instruction and in total ignorance of notes as written, the boys announced themselves as the Dixieland band. The announcement made no immediate sensation in New Orleans. The band's services were not in instant demand. In fact, the four boys knocked at the door of opportunity for months before they finally forced themselves into a job at a local dance. The remuneration was six dollars or one dollar and a half for each budding musician. Other jobs followed. Then fate beckoned them to a popular grill.

The Dixieland band made good because, in their ignorance of written music and innocence of technique, the boys committed many atrocities in the name of the muse. The violinist wolfed his tones, which no good musician should do. The trombonist blatted and sounded many a flat and sharp where accidentals should not have been heard. The cornetist achieved blue notes by blowing on his cornet when the water key was open. The trap drummer indulged in many a raucous noise with the aid of cuckoo calls, horse neighs, nose blows, and other devilish devices. But they made a hit and their fame spread to far-off

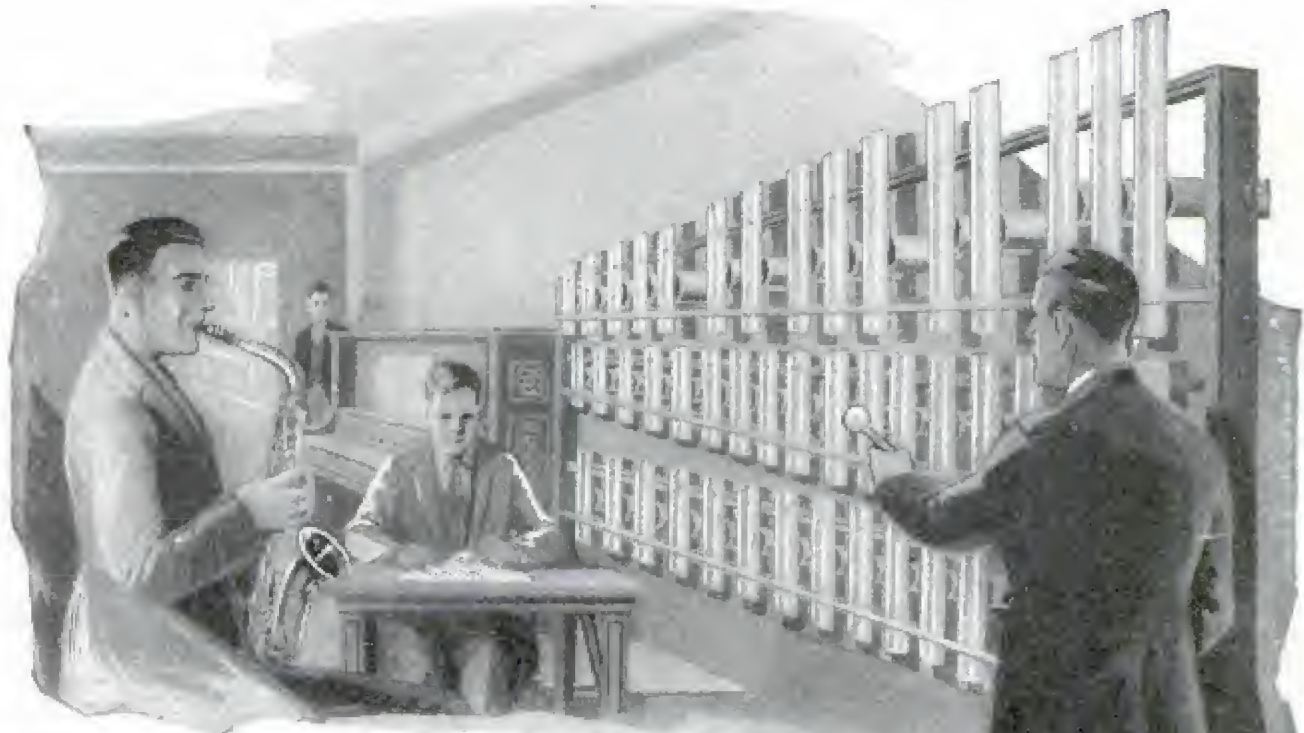
Chicago. Down from Chicago, in 1914, came a restaurateur named James. James came, heard and was conquered. He offered the four New Orleans boys the princely sum of twenty-five dollars per week a piece and all expenses to play in his Chicago restaurant. The offer was accepted with alacrity. Mr. James was given no time in which to change his mind.

Half scared and half thrilled, the four members of the Dixieland band opened their Chicago engagement in the Boosters' club. They were a riot. Police reserves were called out to keep the mobs of patrons at bay. And then one night, while the boys were catching their several breaths after an unusually enlivening blue number, somebody in the restaurant—it has never been decided just who did it—shouted, "Jazz 'er up, boys."

Now there are thousands of jazz orchestras in this country. Almost every town of 5,000 has one or more. Few vaudeville programs are complete without a jazz number. Many a student in our institutions of higher learning is completing his education by playing



Rehearsing a Jazz Selection and Working Out the Parts for the Other Instruments; the First Jazz Band Never Rehearsed, Because None of the Members Knew or Could Read Music



Courtesy The H. N. White Co.

Huge Group of Musical Testing Bells, with a Range of Three Full Octaves. Used to Test Pitch of New Instruments

jazz engagements during the summer. From a quartet of cornet, clarinet, trombone and drums, the modern jazz orchestra has grown into a mighty force for the perpetuating of the reign of reeds and rhythm. First the piano was added. Then came the moaning, wailing saxophone. Then the oboe arrived, and finally all the wood wind instruments and the wealth of imitations to which the trick trap drummer is so much addicted.

The old simple syncopated melodies, such as Irving Berlin's "Alexander's Ragtime Band," have been succeeded by Vincent Lopez and his jazz version of "The Covered Wagon." Our distinguished pianist and composer, Edward Burlingame, has brought out a "Jazz Study" for two pianos. The brilliant Texan, Harold Morris, has composed his "Second Sonata" in which are incorporated many negro tunes. Powell's "Negro Rhapsody," Whithoner's "Times Square" and Carpenter's "Krazy Kat" are among the current contributions to the literature of American jazz.

So many of our jazz orchestras invaded foreign fields that the French government made a determined, although not wholly effectual, effort to bar them, for they were cutting French musicians out of long-held jobs. But the jazz orchestras, augmented by helicon basses and a terrifying assortment of marimbas, chimes, bells, xylophones and whatnots, are sounding the dominant notes in American

music. It is nothing for a boy still in high school to be bitten by the jazz orchestra bug and to invest \$400 in various bird calls, animal imitations and instruments of percussion, while the professionals go much farther.

I once spent an evening with Ross Gorman, of the Paul Whiteman organization, inventorying his stock in trade. Ross is primarily a saxophonist. But all jazz artists must specialize in effects. Ross was getting his with equipment valued at \$3,540.

One trap drummer of my acquaintance has more than \$1,000 invested in his imitations and percussion instruments. But it pays them well. Ross makes about \$400 a week although that is small change compared to Vincent Lopez and his weekly income of \$5,000.

And there is a bit of a joke on those who raise an outcry at the increase in jazz music and orchestras. Some jazz players may make the sounds of jungle beasts. But the interesting phase of the whole situation is that while most of our popular jazz tunes are transcriptions from some classic melody, many of our modern master musicians, especially those who live and move and have their being in cul-

tured Europe, are accepting these jazz tunes as typically American and are giving them what these master musicians regard as classical transcriptions.

So you see there is something to the parallel questions of where did jazz come from and whether the egg or the hen came first. Probably jazz did come from the jungle by very easy stages. But having come from the jungle via Beethoven, Handy, Berlin, and the boys from New Orleans, it is becoming refined by those who sit in the seats of the musically mighty.

Jazz teaches us to keep time to a tune. It also familiarizes us, in theater, dance hall, cabaret or restaurant, with the melodic themes of Rachmaninoff's "Prelude in C," Dvorak's "New World Symphony," Schubert's "Serenade," Handel's "Messiah," Beethoven's "Moonlight Sonata," the Hungarian rhapsodies of Liszt and even Chopin's "Funeral March" and Mendelssohn's "Spring Song."

The works of Oscar Strauss have been metamorphosed for the dance hall. Wagner's "Evening Star" from Tannhauser has its jazz version. "Yes, We Have No Bananas" was, note for note, parts of three other pieces, the "Hallelujah" chorus, "I Dreamt That I Dwelt in Marble Halls," to say nothing of that song of our youth, "Aunt Dinah's Quilting Party." Melodious truffles from Nevin, Delibes,

Chaminade, Moszkowski, Grieg, Schumann, Puccini and Brahms are revamped into super-syncopated jazz tunes and interpreted for our tapping feet by trombone, saxophone, helicon and drums.

"Home, Sweet Home," "Massa's in the Cold, Cold Ground" and "Carry Me Back to Old Virginny" are jazzed in many a supper show palace. Even Rubinstein's "Melody in F" and the wedding march from "Lohengrin" do duty as fox trots.

But, barring the shock this gives the musically expert, I see no harm in it. Melody is the basis of all true music, and if the jazz orchestras familiarize the great American public with melody, much good must come from it.

589 TREES AND LEAVES OF CEMENT FORM GARDEN DECORATIONS

The possibilities of cement in the decorative arts were further illustrated at a London exhibit featured by grotesque replicas of trees molded from the material. The so-called cubist influence was apparent in the designs. The broad, sharp-angled leaves, resembling big shingles, were set at varied positions to give the effect of branches, and the trunks were four-square columns set close together. Advantages of the "property trees" are that they can be placed where natural ones would not grow and that they blend with certain bizarre architecture.



When Cement Workers Turn Artists: Fantastic Trees Shown at London Exhibit to Illustrate the Possibilities of the Material for Garden and Exterior Decoration; Buildings Also Were of Strange Design

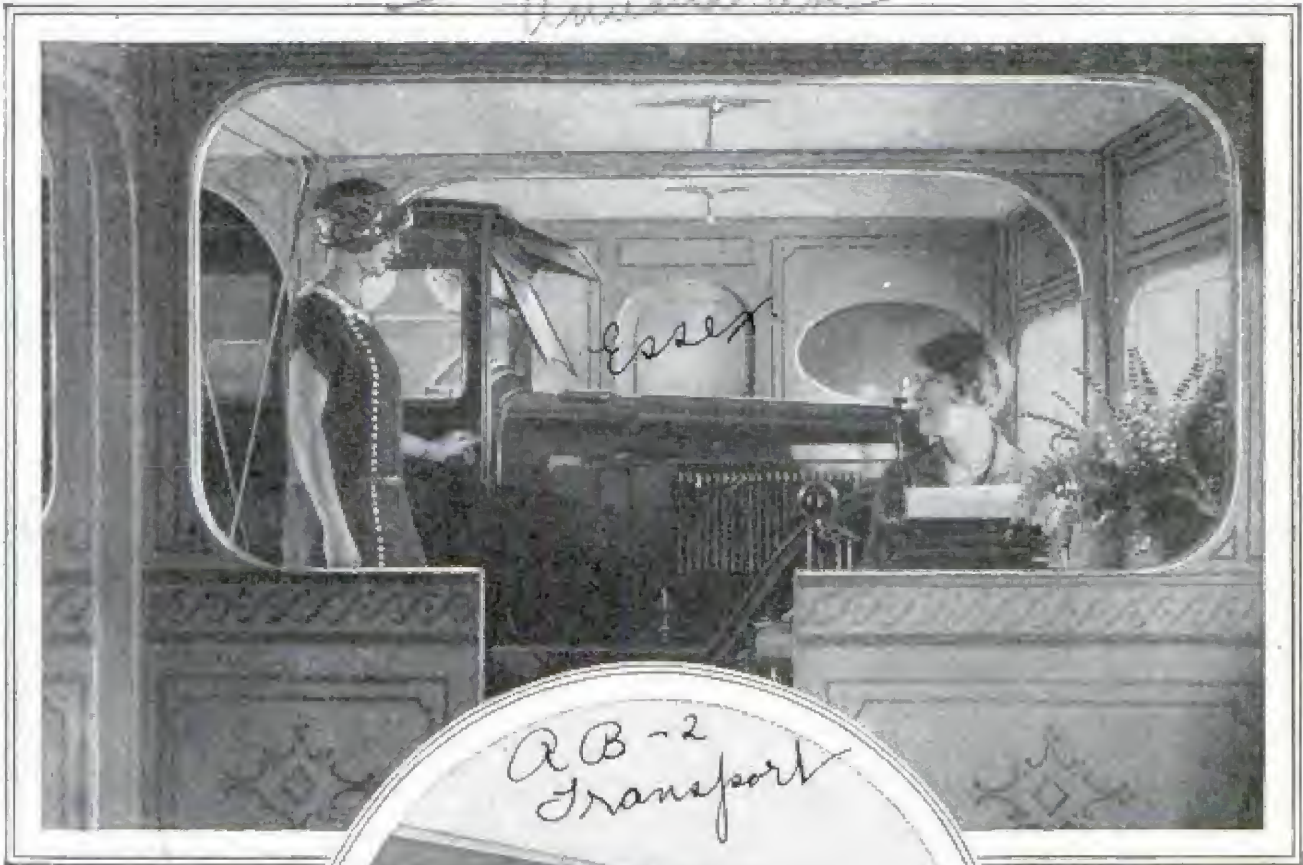
Mallet Stevens in the Garden of the Bank of England

650 Commercial

Designer - Vincent J. Burnelli

SALESROOM IN AIRPLANE HOLDS AUTO AND DESKS

General Use



Interior of Salesroom, Housed in Airplane, with Sample Auto and Office Workers, and Exterior of the Ship

Has the day of the "flying office" arrived? A step in that direction has been achieved in a monster airplane with a wing spread of eighty-seven feet. Its fuselage was fitted up as an automobile salesroom, containing a sample car and office equipment, in addition to sufficient accommodations for the necessary personnel.

650

ORCHIDS FOUND IN FAR NORTH IN STEAM-HEATED VALLEY

Legends of a "tropical valley" in the extreme northern part of British Columbia, where orchids and wild honeysuckles grow in rich profusion near mountains capped with ice, have been verified by official reports from Maj. E. B. Hart, who was commissioned to make a survey of the province. His findings, now on file in the

archives at Victoria, not only substantiate the tales of Indians and trappers who described the valley and its 300,000 acres of good land, but explain the apparent mystery of its mild temperature. Hot springs, extending along the course of the rivers Liard and Toad, literally

steam-heat the valley so that even in winter, the depth of snow is not over six inches, while less favored areas are blanketed to a depth of three or four feet. In season, upon bottom lands, are found luxuriant pine grasses, pea vine and lupins with an occasional orchid, while scattered growths of poplars attain a diameter of fifteen inches. Maj. Hart attributes the springs to weak spots in the earth's crust.

Approximately 21,666 gallons of gasoline are produced in the United States every minute.

*Clemington-Burnelli Aircraft Corp.,
Hartford, Conn.*

*Cmt. Francis Leitch, Esq.
Hartford, Conn.*

**ELECTRIC-HEATED HAT BLOCK
PREVENTS SCORCHING**

Danger of scorching hats when shaping them is practically eliminated in an electrically heated block with a red safety



Electric Hat Block. Showing Control Switch and Safety Light That Signals Too High Temperature

light that flashes when the danger point is reached. The block has a two-heat control switch to maintain an even working temperature, is warmed quickly and is adapted to hats of different sizes.

ONLY TENTH OF AMBER SUPPLY
FIT FOR PIPE STEMS

Combing the beaches of the Baltic sea as their ancestors did 3,000 years ago, fishermen every fall search for precious bits of amber washed up by the waves and tangled in the seaweed. The material is petrified rosin from prehistoric forests and about half of the world's annual supply of 250,000 pounds is found here. Although there are many imitations, the demand for real amber is still great, and the introduction of substitutes has not changed the methods of the fishermen. They must brave rough weather, for the bits are washed in most plentifully only when the winds are strong and blow from the direction of the submarine deposits. Weeds likely to contain amber are dragged in with forklike rakes, and pieces that may be dropped to the sea floor, are caught in nets attached to the end of long

poles. The workers wear mufflers to protect themselves against the cold, and dash in upon the beach every few moments to warm themselves at fires which the women have built. If the weather is unusually severe, the fishermen link themselves together with rope like Alpine climbers. Catches of twenty to thirty bushels of amber within three or four hours were known in the eighteenth century when the supply was more plentiful. Such a haul was valued at more than \$4,000. Like diamond miners, amber fishermen are lured by chance and dream of finding large pieces such as the thirteen and one-half pound lump picked up in 1803 by a stroller along the beach. It is now in a museum in Berlin and is valued at \$10,000. Out of every 100 bushels gathered today, only about one is fit for carving into pipe stems and other articles. Some bits imprison rare leaves or insects and these are in great demand among scientists. Associated with legends, and a rival of spices in building up trade routes and spreading civilization, amber was regarded by the ancients as a mysterious substance because of its magnetic properties when rubbed. The Greeks gave it the name "electron."

LONG-HANDLED SOLDER DIPPER
PREVENTS BURNS



For soldering or tinning joints overhead or in other difficult positions, a dipper with a swinging cup that always remains upright, prevents dangerous burns that often occur from spilling, and eliminates waste. The solder requires but one heating for fifty to seventy-five it is claimed, as warmth to keep it tained in the cup.

Longer handles may be substituted for the regular one, if desired, so that a stepladder is unnecessary.

As a substitute for glass, a transparent sheeting material now on the market has been adapted to crystals for watches. The disks will not break, are held in place by a patented bevel and can be trimmed to fit with scissors or a file.

Ed. du Pont

International Correspondence School 349
School Scranton Pa
Chicago Technical College 118 E 36th St
La Salle Extension University 4101 S Michigan Chicago
 105



What Home Study will do for You

The Campus, with Two Main Buildings, of One of the Large Correspondence Schools, Which Has Educated Hundreds of Thousands of Students in Their Spare Hours at Home

By DR. FRANK CRANE, *50 W. 47th St. New York*

BENJAMIN FRANKLIN said, "Investment in knowledge always pays the best interest."

A comparatively rich man once said, "The way to have money is to spend less time skimping pennies on small salaries and more time on preparing yourself for high-salaried positions. If you make yourself worth enough, more money will come."

Good health and a trained mind are the two legs that raise a man above the crowd. He should form sane habits of living for the sake of his health and then devote himself to improving his mind.

Inventive genius is one of the things that is no respecter of persons. The poor man who cannot afford a university training may possess it. He needs the tools of knowledge to liberate it. The easier access to advanced learning through home-study courses has placed these tools within the grasp of all.

It is interesting to note that few of the men who have given us our great revolutionary inventions have been men of favored circumstances.



Instructors' Room in a Correspondence School, Where the Lesson Papers of the Students Come for Correction; Faculties in These Colleges Are Often Larger Than in Many Universities



Part of the Mailing Department in a Correspondence School, Where Lessons and the Corrected Papers Are Distributed into Regional Sacks to Speed Up Post Office Delivery

The little hunchback immigrant, Steinmetz, arrived in the steerage in the late eighties. He was penniless and his first job paid less than that offered a ditch digger.

Henry Ford, when a mechanic in Detroit, built his own modest little house at night after work, while his wife held a lantern.

The man who gave us the telephone was in dire poverty even after a company had been formed to advance its use. It is said that on the early books of the treasurer of the company can be seen such items as "Lent Alex. Bell fifty cents."

In 1869, when Edison came to New York, he did not have a cent. He had left his books in Boston as part payment of his debts. It is said that his first meal in New York consisted of tea which he begged from a professional tea taster whom he saw at work.

Real genius lies oftentimes in those who cannot afford attendance at an institution



A Corner of the Reference Library of One Big Mail School, Where Complete Collections of Books on All the Subjects Taught Are Available for the Use of the Instructors

of higher learning. Home study opens the door for those who are willing to apply themselves.

No such course will do it all. The result depends ultimately upon the man. But it will help him direct his energies.

Like prohibition, evolution and the Ford automobile, correspondence schools have been made the butt of countless jokes.

The result is that some people lose sight of the significance of the work they are doing.

About twenty-five years ago, they began to assume prominence. During the years since, they have been one of the big influences in the tremendous and beneficial attempts to "popularize" knowledge. They have helped take the mystery out of technical subjects. They have sought to bring knowledge within the grasp of the common man.

Real progress comes when the mass of the people are being educated instead of a few. In the thirteenth century the Renaissance gave the world a handful of super-scholars, but left the masses in poverty and ignorance.

The past quarter of a century has been one of putting spearmint in the intellectual chewing gum. The result is that the average amount of education is being raised.

Coincident with this rapid expansion of popularized education, there has been a period of unparalleled fruitfulness in mechanical inventions. The almost unbelievable progress along the lines of aviation and radio are examples.

There can be little doubt that this increased activity is largely due to the wider spread of scientific knowledge to the common man.

It is when a man stops studying that he ceases to grow.

Everyone should go to college if possible. However, for many reasons, a college education is impossible to many.

Thwarted in his ambition for a college education, a young man can do one of two



A Section of the Students' Service Department in One School, Where Records of the Lessons Mailed and Received, with All Other Work Done by Each Pupil, Are Kept on File

things. He can give up or he can study at home. If one has the will power to study at home, the struggle in itself is a developer of character.

To take yourself by the scruff of the neck and make yourself get down to work after dinner in the evening instead of listening to the latest jazz music over the radio, means that you are gaining self-control, which is one of the ends of all education.

"The science of education," Charles P. Steinmetz, the electrical genius, once said, "is the science of helping people find out what they want to know."

Too often the fight for success is likened to a football game or a prize fight, where you smash your way through the opposition of others.

In truth it is oftener like traveling a lonely road.

In the "Americanization of Edward Bok," the former editor tells of his surprise at this discovery. He says:

"The path to success is wide open. The competition is negligible. There is no jostling. In fact, to travel in it is lonely."

This is what the man who studies at home must remember.

There are few sudden spectacular conflicts to wrestle with. There is only the steady grind of making yourself fit for bigger things. There is the constant internal struggle resisting the desire for a

"good time" when there is work to do. There is the strain of keeping to the lonely path of self-control and hewing to the line of a determination.

This is the road to achievement and it is the biggest test of a man's real worth.

The big problem is to get ahead within yourself and not to get ahead of someone outside of yourself. That will take care of itself.

Price - \$37.50 including springs, mattress and installation



Dotted Lines Indicate How the Double Bed Extends to Rear of the Coupe; Bed for Child Above

FOLDING BEDS IN AUTO COUPE 53/ HOLD THREE PERSONS

Occupying but little space when folded up, a bed big enough for two persons fits inside the auto coupe which needs little remodeling for the installation. In addition, sleeping space is provided for a child across the seat back. The springs of the larger bed are suspended only at the ends, increasing comfort, and the mattress is an inch longer than the standard size. It extends the full width of the coupe and back into the rear part of the body. When not in use, the beds are concealed and can be put down or made up in less than two minutes, the manufacturers assert.

SAND GRAINS ROLL MANY MILES BEFORE BECOMING POLISHED

For most sand grains, a journey equivalent to two trips from the center of the continent to the ocean is necessary before they acquire a round, smooth shape. They wear away much more quickly when carried by water than when borne in the air. These are among the results of a western professor's three years' study of sand to discover the origin of oil-bearing

deposits. Prospectors, he believes, will be greatly aided in further searches, if they know whether wind or water laid down the strata in which oil is found. To study actual conditions, grains were placed in bottles and rotated on drums. Some of the containers were partly filled with water and others held only the sand. In a few hundred hours, the sand showed practically the same effects that result from hundreds of years of natural weathering.

546 MILLION MATCHES MADE AS ONE

Quantity production is imperative in match manufacturing, and to meet the enormous demand, special machinery has been devised to save time and labor. For instance, the heads are formed successively by passing the sticks, mounted on an endless belt, through three chemical solutions. A million matches are treated as a unit in this way. A cutter that prepares the wooden splints for dipping has a capacity of 40,000 a minute.



As Matches Attached to Endless Belt Pass through Chemical Baths, the Heads Are Formed

*Esustans G. Anderson,
University of Oklahoma*

no data

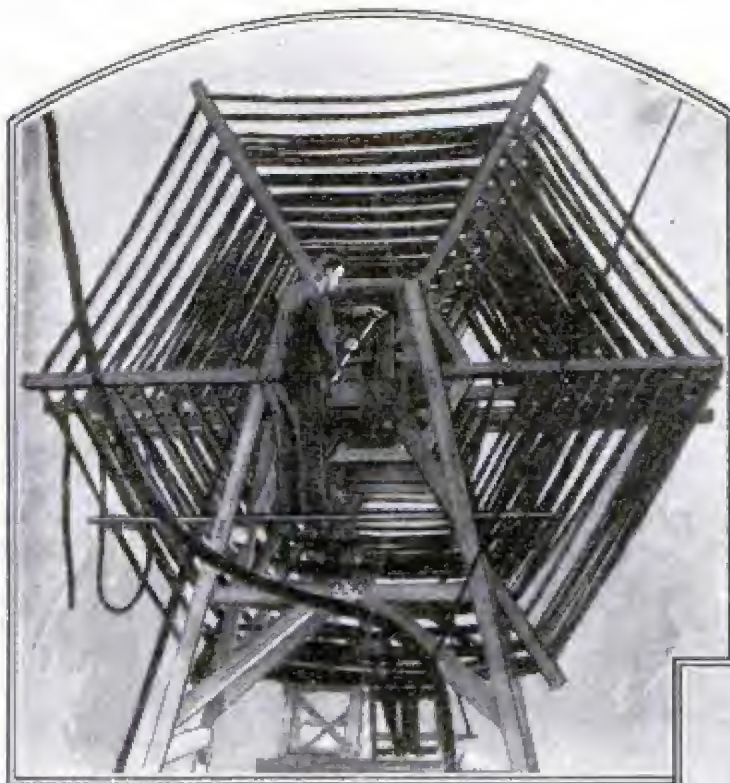
*Price Built in Coupe Bed Co. Los Angeles
5031 S Vermont Ave. Calif*

*Capstone Press Co. N.Y.C.
91-7th Ave*

MASTS AT HUGE RADIO STATION EIGHT HUNDRED FEET HIGH

Twelve 800-foot masts, weighing 300 tons each, are required to support the

"winged projectiles," mostly engine and propeller, and with wings of the minimum

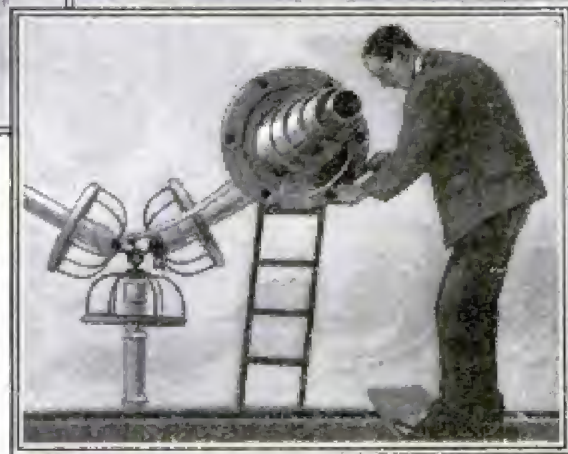


Inductance Frame, Huge Insulators and Lead-In of Powerful Wireless Station at Rugby, England

aerials at the huge British government broadcasting station at Rugby, Eng. The size of insulators, inductance frames and other parts is in keeping with the proportions of the rest of the equipment, as shown by the accompanying illustrations. The aerial system is one and one-half miles long and one-half mile wide. Not far away, at Daventry, is another large station with two 500-foot towers placed 800 feet apart. They are anchored on top of a hill 600 feet above sea level, so, from the standpoint of altitude, are the highest in England. Both are expected to be important units in the British empire scheme of international communication by radio.

WINGLESS PLANES PREDICTED AS RESULT OF ARMY TESTS

Motors that can propel airplanes without the lifting power of the wing surfaces have been developed, army tests disclose. Using a Curtiss D-12 racer, Lieut. Russel Maughan flew edgewise, maintaining a straight course at 225 miles an hour, the body alone being sufficient to support the weight. Pursuit airplanes of the future, army officials predict, will be literally



length and surface required for taking off, steering and banking.

COPPER TAKEN FROM WATER WITH AID OF TIN CANS

Nearly 100,000 pounds of copper are salvaged annually from the water of a mine by running the liquid through heaps of old tin cans and scrap iron. The process first produces iron sulphate, due to the action of the water in eating away the iron. From this, a sludge is formed which, when dried, assays fifty per cent pure copper. Each 1,000 gallons of water yields five and one-half pounds of metal. The mine flow is pumped through steel pipes lined with wood into long troughs, where most of the copper is deposited. In six months, 155 tons of tin cans and forty-seven tons of scrap iron were consumed by the process.

Copper Queen Co
Tishbee
Prin &

Kansas City Post
10/5/25

3/8

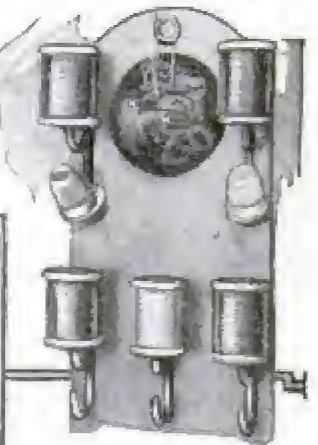
Time and Money-Saving Tools



Faucets Can Be Mended without Tools by Using This Split-Pin Washer That Is Pushed in Place



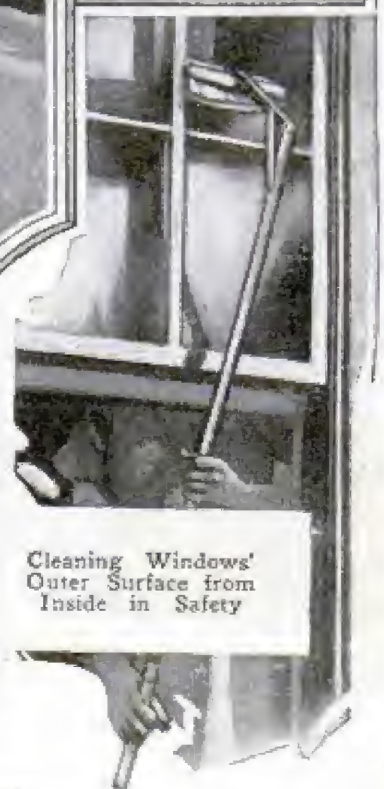
With Baby Safely Seated, Mother Can Drive Car in Comfort



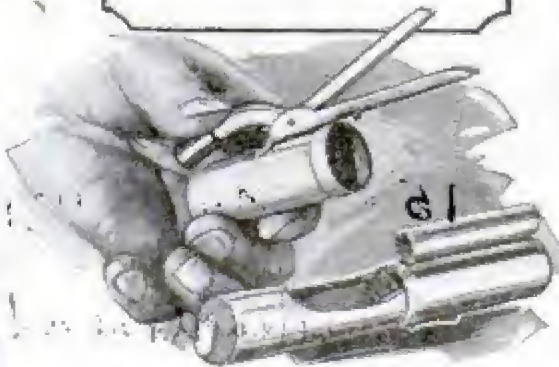
Holder for Sewing Articles Fits against Wall



Portable Electric Boiler to Sterilize Water



Cleaning Windows' Outer Surface from Inside in Safety

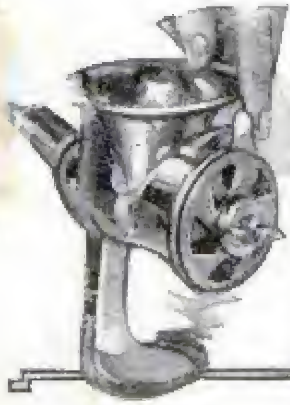


Fitting into a Case Less Than Four and One-Half Inches Long, a Pocket Curler Is Always Ready; at Left Is a French Floor-Waxer Intended to Give Even Pressure on Every Spot



Removable Porcelain Covers for Bathroom Fixtures Improve Appearance

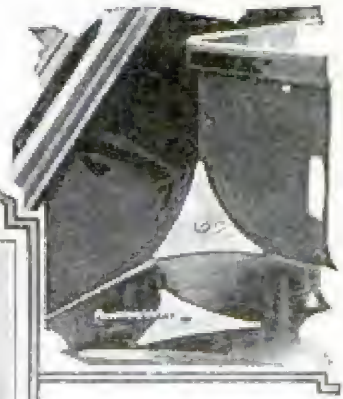
for Woman's Workshop in Home



"Gear-Shift" Meat
Grinder Changes
from Coarse to
Fine Knife by
Pressing Lever



Electric Water Heater and
Radiator in Wall Add Lux-
ury to Bathroom



Metal Shields to
Keep Dust Out
of Corners Are
Easily Installed
and Save Work



Pail for Many Uses
Fits inside White-
Enamel Swing-Top
Holder



Sealing Tape to
Keep Juice in
Pies



Patching Compound
for Use Instead of
Sewing and Darning
Withstands Laund-
ering Processes



Lighter Pastry
Dough and
Quicker Work
Are Possible
with Double
Rolling Pin



Heavy Canvas Bag Will Not
Tear When Crushing Ice



Mop Wringer
That Does Not
Splash and Saves
Stooping

Picture Service
519-13 POPULAR MECHANICS
Washington D.C.
**TREES OF FANTASTIC SHAPES
 REVEAL TRIMMER'S ART**

Years of labor and patient care are represented in the trees of an Iowa farm-

menace to health in manufacturing plants, into a cheap fuel for producing power is being made by the bureau of chemistry. It would replace coal, gasoline and oil, saving the country millions of dollars an-



Copyright, Henry Miller News Service

Iowa Farmer's Yard of Oddly Trimmed Trees; All Are Thriving in Spite of Repeated Cuttings, and Some of the Designs Are Being Changed by Gradual Pruning

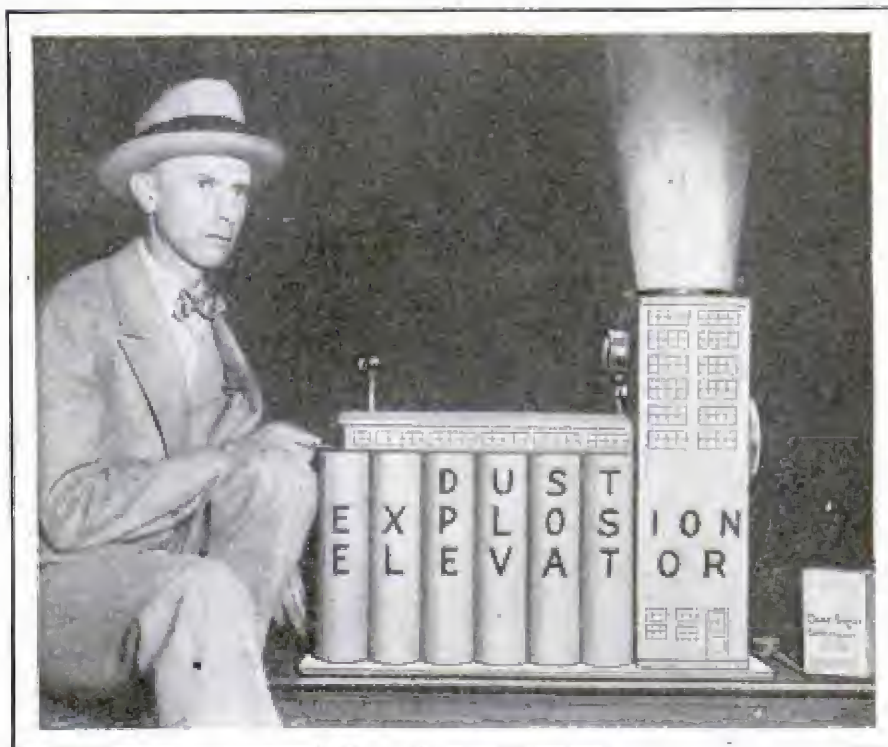
er's front yard. They have been trained and trimmed into fantastic shapes like weathervanes, spirals, animals and other forms, and in spite of repeated cuttings, have flourished. They are set far enough apart to permit a clear view of each from the road.

**EXPLOSIVE POWER FROM DUST
 521 TO RUN AUTOMOBILES**

An attempt to convert waste dust, now a serious potential fire hazard and a

nually, scientists predict. According to Dr. C. A. Brown, chief of the bureau, there are many products from which inflammable dust, suitable for fuel purposes, could be derived. These include various kinds of chemicals, metals, wood, leather, cork, grain, rubber, sugar, cocoa and cinnamon. Carbon in these substances combines with oxygen, producing the combustion.

The hazard of grain dust in elevators is well known, and to prevent accidents and explosions, elaborate precautions in the form of construction and in methods of handling the grain are taken. At a recent exhibit in New York, chemists from the bureau made use of this elevator problem to demonstrate the principles of dust explosions and show how they may be able to harness the power to run machinery. Into the miniature shaft of a model elevator, was poured a teaspoonful of corn starch or sugar. A piece of paper was clamped over the top of the shaft. Then air was pumped into the small passage, stirring up the powdered substance which had been carefully dried and finely pulverized for the demonstration. By means of an



Illustrating the Explosive Power of Sugar; Model Elevator Photographed the Instant an Electric Spark Ignited Dust

W.A. Noel, Engineer

electric spark, the combination of dust and air was ignited, the carbon in the floating particles uniting with the oxygen in the air and producing a miniature explosion of such force that the paper and its hoop were blown to the ceiling. The test not only showed the unharnessed power lying in inflammable dust, but demonstrated what occurs when a real elevator "explodes," frequently with loss of life and heavy damage.

The most powerful of all fuel dusts is said to be that of aluminum.

METAL PLATING PRESERVES FLOWERS

A process of plating flowers and foliage with metal to preserve their original appearance is being used by an associate of the late Dr. Charles P. Steinmetz. He predicts that roses he has treated with silver in this way, will be found in a perfect state of preservation when the plating is removed ten years hence. Besides the roses, he has prepared golden-maple leaves and copperized bunches of ivy. The method involves an electro-chemical treatment and the scientist asserts that it can be adapted to furs. By a special heating process, he expects to deposit metal on the hairs without destroying their softness. Silver-fox fur, for instance, could be imitated in cheaper varieties, by this coating, it is claimed.



Coating Cut Flowers and Leaves with Metal

TOKYO HIRES SANDWICH MEN TO ANNOUNCE CENSUS

When the census is to be taken in Tokyo, squads of sandwich men, bearing



Tokyo Sandwich Men with Their Signs Announcing a Census Taking, Ready for Trip through City

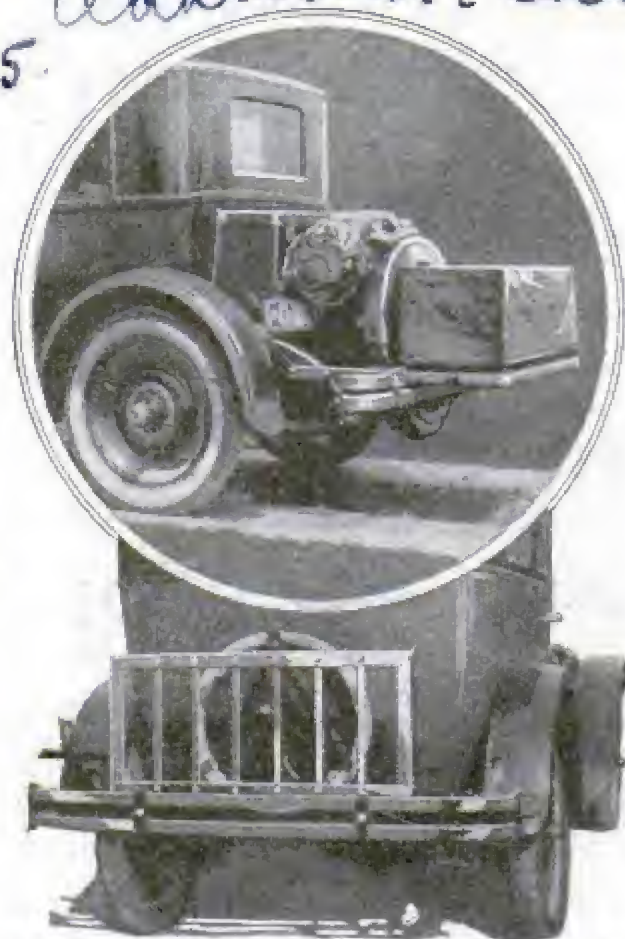
placards announcing the event, are sent into various districts of the city to prepare the population for the arrival of the statistic clerks. This form of advertising, it has been found, reaches more persons than printed notices in the papers.

NUMBER OF FARMS DECREASES FIFTEEN THOUSAND YEARLY.

In the past five years, the number of farms in the United States has decreased 75,735, or more than 15,000 yearly, according to the department of commerce. The total is placed at 6,372,608. The decline was not general, some sections reporting increases, as in Texas where a gain of 30,387 farms was shown over the 1920 figures. The greatest decrease was found in Georgia where the total dropped from 310,732 in 1920 to 249,098 in 1925. Illinois had 225,645 farms last year, a decline of 11,536 as compared to 1920, while Wisconsin reported an increase of 3,838 over the previous census.

Names and addresses of manufacturers of articles described in this magazine will be supplied by our Bureau of Information.

Ans. Mr. Mac
401 W. Broadway



Luggage Carrier Extended and Folded over Spare-Tire Rim as Extra Bumper

FOLDING AUTO LUGGAGE RACK SERVES AS EXTRA BUMPER

Extending beyond the spare tire to afford extra space, an auto luggage carrier of heavy nicked steel, may be folded up when not in use, and in that position serves as an auxiliary bumper. It is high enough to protect the back of the car and the extra tire and, fitting flat when drawn up, does not interfere with cars behind.



Putting Finishing Touches on Elaborate \$10,000 Model of Lake Steamer "Greater Detroit"; It Permits Inspection of Engine and State Rooms and Is Copied after Original, Even to Carpeting

'MECHANICAL EYELIDS' WINK SOLVES MYSTERIES

Perfection in England of a portable binocular stroboscope, or mechanical eyelids, as compact and easily carried as a pair of field glasses, has made it possible for the eye to see things which heretofore it has been too slow to catch. The stroboscope is a device in which a shutter can be opened and closed at any desired rate, so that moving or vibrating objects seen through it can be made to appear as though they were standing still. If the human eye could wink fast enough it could look at a revolving flywheel, and by winking in tune with the movement of the spokes, see them as clearly as though the wheel were stopped. The new portable stroboscope is expected to prove of value in the study of vibration in machinery, since it will allow direct observation of the smallest movement, without setting up complicated apparatus in order to enlarge the vibratory effect so that it will be made visible to the naked eye.

MINIATURE SHIP IS COMPLETE IN EVERY DETAIL

Details of the S. S. "Greater Detroit" are faithfully reproduced, even to carpets, interior decorations and furnishings, in a model of wood and metal completed at a cost of \$10,000. Seven men worked on it at intervals for eight months. The replica is built on a scale of three-sixteenths of an inch to the foot. It is so arranged that it can be laid open in order that interiors of the state rooms and holds, and the working parts, even to the smallest details, may readily be inspected.

made by Horace E. W. anchor. New York

Fortunes from Tree Stumps



Norman C. McLeod
St. Paul, Minn.

EXTRACTING a fortune from the dead stumps of long-gone pine trees in the millions of acres of cut-over land in the southern states has been made possible by the inventive genius of two men who have developed a process for recovering turpentine and rosin and put it into practice in two southern states.

Using the waste material which the loggers left behind, and which has prevented farmers from taking up the former forest land, they not only are able to recover two valuable chemical products, for which there is a wide market, but prepare the ground itself for agriculture.

Dynamite and modern industrial chemistry have made both things possible.

Less than a century ago, the southern states boasted the world's greatest supply of turpentine and rosin, both used chiefly then for shipbuilding. North Carolina alone was able at one time to produce nearly enough of the pine products to glut the entire world's market. Her forests were so rich that every North Carolinian was said to have his heels covered with pine tar every time he took a walk, a saying from which the residents of the state are still called "tar heels." Today North Carolina produces but a fraction of one per cent of the available supply.

The English settlers had begun tapping the trees in the time of Sir Walter Raleigh to get "naval stores," the old name which still clings to turpentine, rosin and pine tar, though the ships of the world no longer use any appreciable

amount of either. Turpentine and rosin gathering are carried on much the same as maple-sugar collecting, except that the trees may be tapped throughout most of the year. From V-shaped slashes the gum exudes and oozes into collecting pans, and then is sent to the distillery to be mixed with water and distilled. The lighter turpentine passes off into storage vats and the gummy rosin is left behind.

The turpentine business remained good until the need for southern-pine lumber became keenly felt after the forests of the Great Lakes region gave out. In recent years, a large part of the south has been stripped of marketable pine timber, and the turpentine industry suffered as a result.

It remained for Homer T. Varyan, a Toledo scientist, who had invented a process of continuous evaporation for chemical plants, to conceive of recovering the turpentine and rosin left in the stumps, dead limbs and fallen trees left behind by the lumberjacks. He decided the valuable material could be salvaged from the wood by shredding the stumps and then cooking them in live steam. In co-operation with Joseph E. Lockwood he developed the process.

Success was made possible because the turpentine gums are driven to the heart of the stump or log as the outer portion decays. Protected by the rosin, the heart will remain sound for untold years.

Varyan and Lockwood built their first plant in Mississippi, and it proved such

Baltimore, Md.

1431 Nicholas Blvd
St. Paul, Minn.



Resin Storage Yards at Savannah, Ga., Above, Where the Recovered Material from Old Stumps Is Gathered for Shipment to Market by Sea

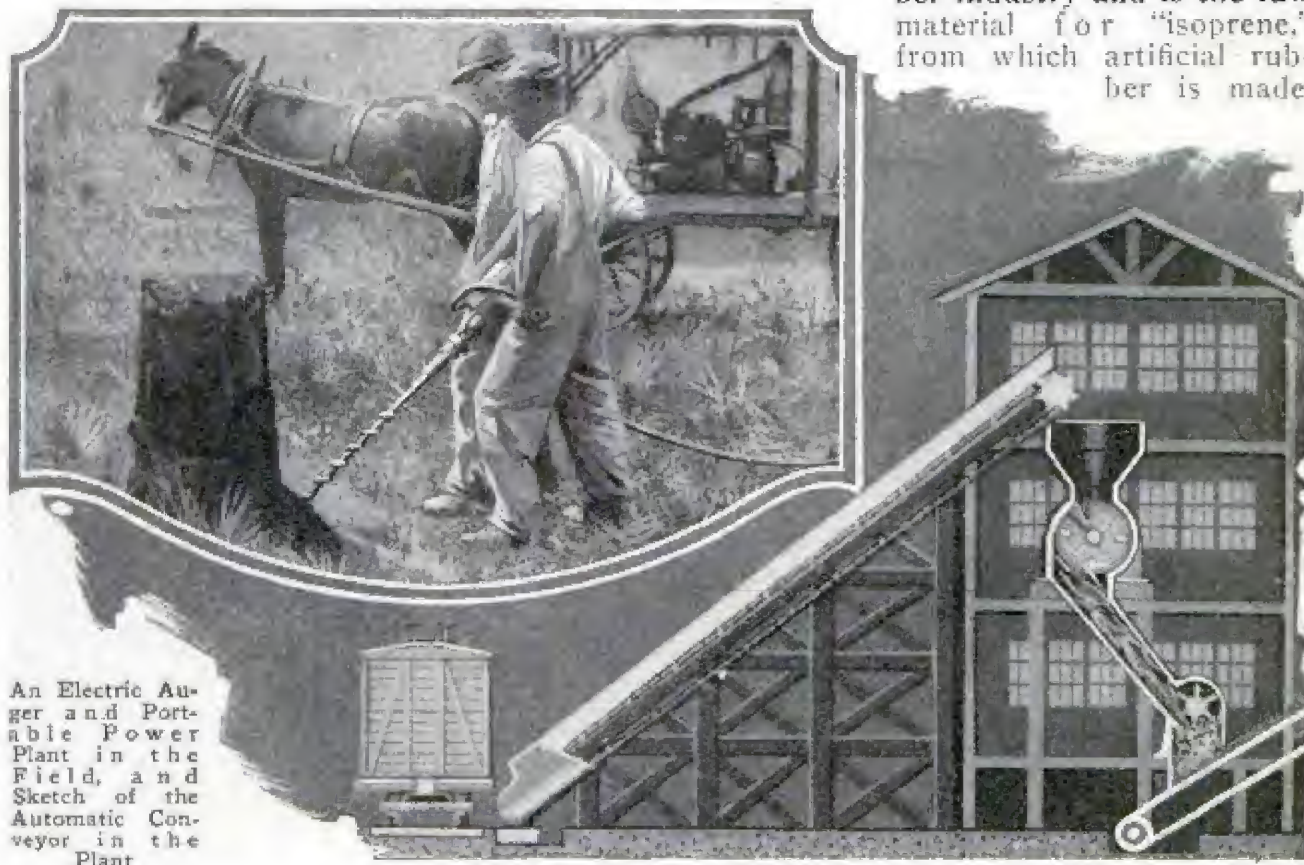
Placing a Stick of Dynamite under an Old Stump to Lift It Out of the Ground; Each Stump Is Blown with a Separate Fuse



a success that a larger and improved outfit was established in Georgia. Their survey indicates there are at least 15,000,000 acres of cut-over land on which to draw for material.

The old stumps are removed by blasting. An electric auger, getting its current

nishes, and has a place in medicine and in making prepared drugs. It goes into shoe polish, as well as floor and furniture polishes, in which it acts as a solvent for the waxes. Patent leather could not be made without it, nor could synthetic camphor. It is used as a solvent in the rubber industry and is the raw material for "isoprene," from which artificial rubber is made.



An Electric Auger and Portable Power Plant in the Field, and Sketch of the Automatic Conveyor in the Plant

from a gasoline-driven generator, mounted on a horse-drawn truck, bores the holes in the stumps. A stick of dynamite is slipped in, a fuse attached and lighted, and the stump and a large section of its roots sprayed over the landscape. The debris is gathered together, loaded on railroad cars and transported to the distillery, where an automatic conveyor lifts it to the hoppers of huge lumber-mill "hogs," massive grinders designed to reduce lumber refuse to the size of matchsticks.

The shredded material is then placed in air-tight cooking vats and subjected to high-temperature steam, which cooks out the gum and prepares it for eventual separation into turpentine and rosin.

Despite the virtual disappearance of the old-time wooden sailing ships, whose hulls and cordage required vast amounts of naval stores, the market for the recovered product is better than ever, thanks to modern industrial chemistry. Nothing has been found to take the place of turpentine in many essential industries. It is used for thinning paints and var-

It prevents colors "bleeding" when calico and print goods are stamped and goes into fireworks, wood stains, printing inks, crayons and many other articles.

Rosin, the other product recovered from the waste of the stumps, is a vital element in making laundry soaps and soap powders, sealing wax, axle grease, paint driers, ceramic enamels, cheap linoleum and oilcloth, medicinal plasters, ointments, foundry cores, sticky flypaper, shrapnel-shell filling and in scores of widely varying manufacturing processes.

Besides the two chief ingredients of stumps, the distilling process also yields quantities of pine oil, which is used in the concentration of low-grade gold ore by the flotation process, and in disinfectants and other articles.

Although still young, and operating in only two localities, the pine-stump recovery industry this year used more than 2,000,000 pounds of dynamite to remove the stumps from the ground. The age of the stump is no detriment, since the older and more rotten the exterior, which is discarded, the richer the heart will be.

No stumps cut less than ten years ago are used. By concentrating on the rich heart-wood from a portion of each stump, the same amount of gum is recovered as if the entire stump had been distilled when new, and yet only a fraction of the original amount of wood

qualities are dependent wholly on the method in which the cheese is cured and seasoned. As in the maturing of French wines, the cheeses bear data, giving the whole "pedigree" from start to finish, and the exact location of each cheese in the storage vaults is



Fine Chips of Pine after Passing through the Shredder. Above, and a Close-Up of a Dynamite Blast Showing a Stump Being Removed from a Field of Second-Growth Pine Timber

must be shredded and cooked. How many million gallons of turpentine and pounds of rosin can be extracted from all the cut-over pine forests of the south has never been estimated, but the forestry department of the state of Louisiana estimates that the stumps in that state alone would yield 340,000,000 gallons of turpentine, in addition to a vast amount of rosin.

The 23,000 square miles of stump land available in the south is equal to the combined area of New Hampshire, Vermont and Connecticut.

YEARS TO RIPEN CHEESE

Various experiments have been tried and adopted in the manufacture of almost 200 different kinds of cheese, but to gain the delicate flavor of the best Italian grades, no less than four years must be allowed for seasoning. There is nothing in the milk or in the preparation of these varieties that gives them their peculiar flavor and mellowness, it is said. These

charted on a map kept constantly under lock and key.

ELECTRIC SHEET-METAL CUTTER RUNS FROM LIGHT SOCKET

Weighing only thirty-eight pounds, an electric sheet-metal cutter is said to leave



no burr on the material and, when adjusted so that the work can be rested on a bench, may be operated by only one man. On sixteen-gauge steel, it has a speed of fifteen feet per

minute, and curves or irregular shapes are cut as easily as straight lines, the manufacturers assert. The action is secured through an eccentric on which the motor-driven cutter is fastened. The knives are removable for sharpening.

embossed. R. Holden, Eng. Highfield, Va. 1911. Tipton and New Road, Chesterfield, Eng.

561

The Hunchard Co. Chgo.

San Francisco in foreground

120

Alameda and Berkeley in

POPULAR MECHANICS

distance

SAN FRANCISCO BRIDGE TO COST SIXTY-FIVE MILLION

520



Pacific & Atlantic

Architect's Drawing of Bridge to Connect San Francisco and Oakland; Spans on Each Side Will Permit Passage of Ships and Ornate Columns Will Mark Approaches

Plans for a bridge, costing \$65,000,000, to connect San Francisco with Oakland have been submitted. Besides traffic space for automobiles and pedestrians, the structure will provide room for street-car tracks, and spans near each end of the long viaduct will be constructed to permit the passage of ships. Artistic approaches with stairways and ornamental columns are included in the architect's drawings.

DUMMY IN ARTIST'S STUDIO SERVES AS MODEL

Saving the expense of hiring a person to pose, a flexible dummy an artist uses



Harrison Fisher Adjusting Dummy Model He Uses in Studio to Aid in Portrait Painting

can be arranged in lifelike positions. Head and features have been accurately molded and figure can be costumed as desired. It also serves as a support to steady a live model, when used, in various poses.

GOLD FOIL, CLEAR AS GLASS, TO IMPROVE RADIO

Gold and nickel foil, but a fraction of the thickness of the thinnest leaf made by hammering, has been produced by a German scientist. The layers are said to be as translucent as glass. Photographs, taken through a covering of the foil over the camera lens, could hardly be distinguished from those made in the usual way. It is expected that the filaments will be especially valuable in studying various phases of radioactivity and forms of energy due to the radiation of gaseous matter. Though but a millionth part of a centimeter in thickness, the centimeter being about three-eighths of an inch, a few of the strips together carried sufficient electric current to light several electric bulbs, and the films could be swung rapidly back and forth without tearing. Practical adaptation of the discovery is expected to improve radio, telephones, phonographs, and other appliances that require delicate membranes or conducting surfaces, by bettering tone quality and increasing the range of the instruments. The process was discovered by chance while the scientists was investigating chemical rays. It is being kept secret, but is based upon a kind of galvanic precipitation of the various metals.

Dr. Carl Muller

Harrison Fisher

Berlin, Germany, Physics and Natural Science

Getting Ready for Winter DX

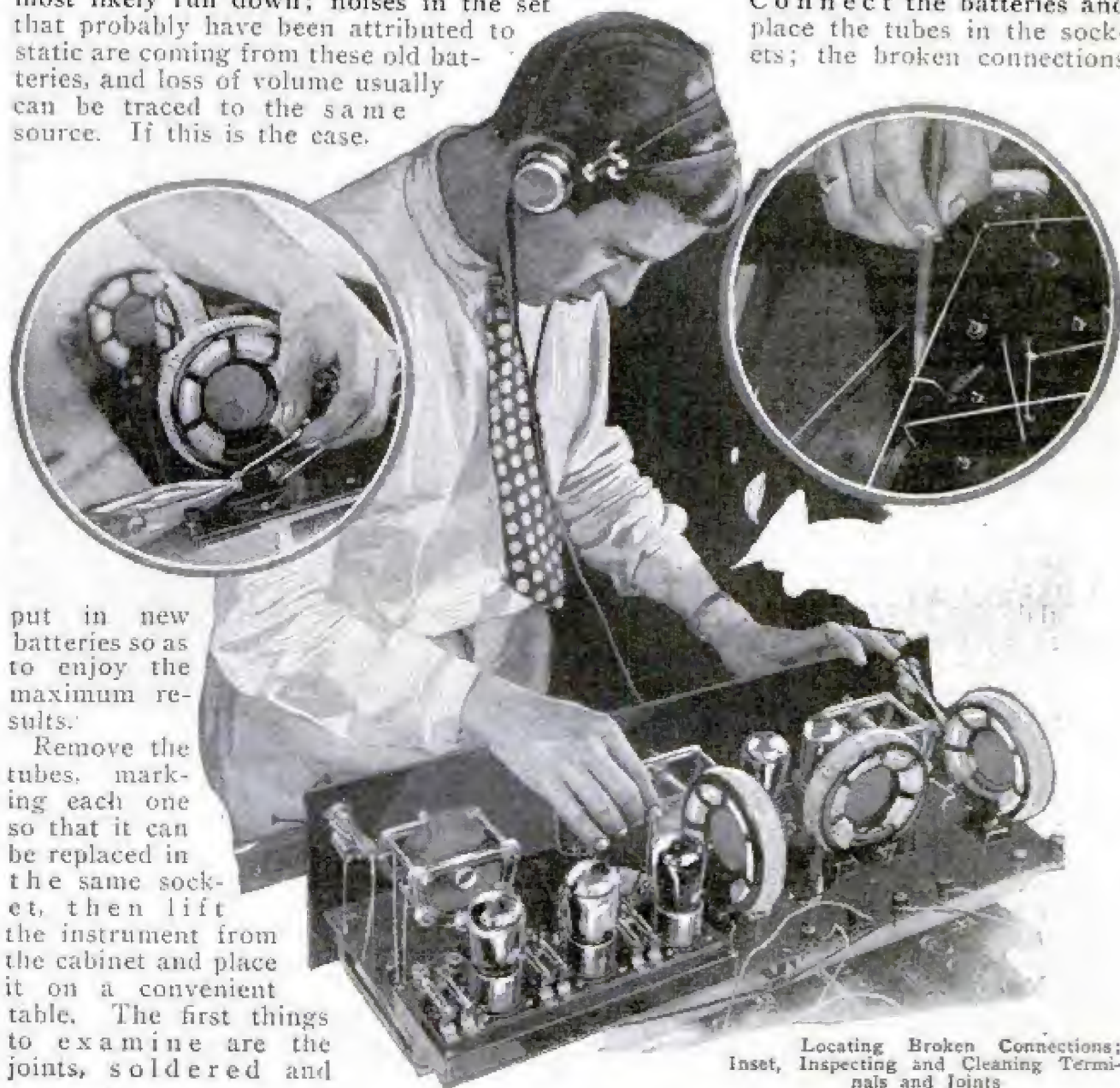
By JOHN R. SMYTHE

WINTERTIME brings the distant stations closer, and the cold clear evenings bring back old friends that have been buried under the summer static, if—and it is a big IF—the set is in proper condition for the best reception. Inspecting the radio set is just as important as automobile inspection. It is sometimes put off until increasingly poor results make it absolutely necessary. Good results depend on first-class equipment kept in working order, and a little attention to these details pays in increased range, better volume, and longer service from the instrument.

Since the set was last overhauled, the vacuum tubes have been burning some 500 or 600 hours. The batteries, especially the B-batteries, have been delivering current over a long period and are most likely run down; noises in the set that probably have been attributed to static are coming from these old batteries, and loss of volume usually can be traced to the same source. If this is the case,

otherwise, as these are a common source of trouble unless the work has been done very carefully. Many times, too much flux has been used and this has run in behind the terminal, forming a high-resistance path, or if the wrong kind of flux has been used, corrosion takes place. Remove the terminal nut and clean with a cloth moistened with alcohol and placed over the end of a screwdriver. Replace the nut and tighten firmly. The terminals on the coils, transformers and tube sockets should all be gone over in this manner. Turn the set over and examine the connections; see that each connecting wire is tightly soldered, and that no wire has been bent so as to touch another; each loose joint here should be carefully soldered. Broken joints can be accurately located by operating the set temporarily.

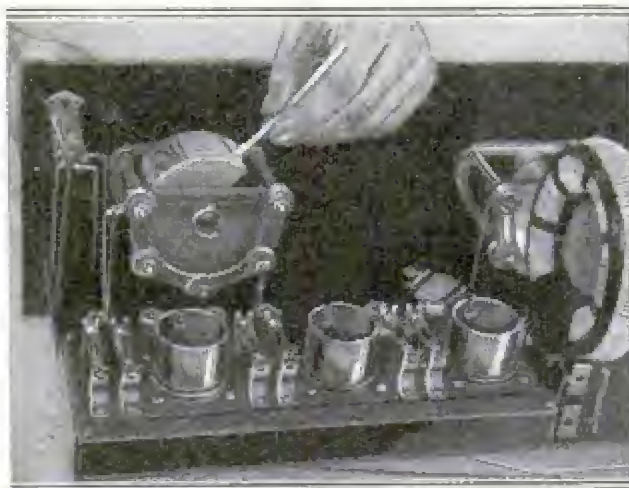
Connect the batteries and place the tubes in the sockets; the broken connections



put in new batteries so as to enjoy the maximum results.

Remove the tubes, marking each one so that it can be replaced in the same socket, then lift the instrument from the cabinet and place it on a convenient table. The first things to examine are the joints, soldered and

Locating Broken Connections;
Inset, Inspecting and Cleaning Terminals and Joints



A Pipe Cleaner Provides the Best Cleaner for Variable-Condenser Plates

can then be located while the set is in actual use by tapping or moving each joint in turn and listening for noises in the headphones.

Dust and dirt are also enemies of good reception as they permit moisture to accumulate and introduce leakage causing troublesome noises. This is especially true in the variable condensers, where dust will gather between the plates; it can be easily removed with a pipe cleaner, used in the manner shown in the photo. If these instruments are of the type provided with wiping connections on the shaft, the points of contact should be well cleaned with a bit of fine emery cloth. If the connections are of the pigtail or flexible type, make sure that they are not broken and that they make good contact. Go over all binding posts and see that they are tight. The rheostats are very important to good operation; examine the terminal connections, and, if corroded, remove the leads, place lugs under the terminals and resolder the connections. Another important point is the contact of

the wiping arm on the resistance winding of the rheostat. If this arm does not make good contact at all points on the wire, poor results are certain; if not, remove the setscrew, bend the arm slightly and replace on the shaft.

Phone and loud-speaker cords in average service should be renewed once a year as the constant twisting of these cords breaks the fine tinsel conductor and causes noises. They are not expensive and are easily replaced.

Good tubes are all-important; if they have been in use for some time, they should be tested. Some will be found much better than others, and the poor ones can usually be rejuvenated, if they are of the standard type, such as the UV-201A or C-301A; this also applies to the UV-199 and the C-299 types. A good tube has an average life of about 1,000

hours, but when excessive filament voltage is applied, the strain is pushed beyond safe limits, and the tube becomes sluggish or paralyzed. No change can be noted by ocular inspection; the tube still lights, but it fails to produce the results obtained before.

Another important point that should not be neglected is examination of the tube prongs. Each should be cleaned with fine emery cloth to make certain of a good electrical contact with the spring clips in the socket. Inspect also the end of each prong, to make sure that the soldered tip is secure. Before placing the tubes back in the sockets, see that the spring

clips in the sockets are tight; if loose, the socket may have to be removed and the screws holding these springs tightened with a screwdriver. After you have gone over the set thoroughly, turn your attention to the aerial and ground.



Lugs on Rheostats and Sockets Must Be Tight and Clean; Below, Inspecting Phone and Speaker Cords

No set will work well on a poor aerial and inefficient ground. The superheterodyne and other types of receivers using loop aerials are practically free from trouble of this nature, unless there is a loose connection, but with the outdoor type of aerial conditions are different. Summer storms may have rendered the aerial ineffective; it may be touching the building, the wire may be broken; lead-in wires may have rubbed against the building, damaging the insulation and causing shorts, especially during damp weather. If the aerial was installed temporarily, it may be that the connections were made without soldering and corrosion has taken place. Solder the connections at the insulators and at the point where the lead-in wire is connected to the main wire. It is best to make a new joint, first carefully scraping all corrosion from the wire. After the joint has been soldered, wrap it with electrical friction tape. This will insure a good electrical connection that will not be affected by the weather. If the aerial has sagged, this slack should be taken up, as a swinging aerial will give poor results and increase the chances for shorts against the building. Inspect the lead-in to the set and see that it is well insulated and in good condition. No. 14 weather-proofed copper wire makes a very good lead-in and should run as directly as possible to the point where it is taken into the building.

The best ground is obtained on a cold-water pipe, the pipe being filed bright and the wire securely fastened to it by means of a ground clamp. Even if this was done when the set was first installed, it is a good idea to remove the clamp and brighten it on the inside with emery cloth, polishing also the contact surface on the pipe before



The Wiping Arm on the Rheostat Must Make Good Contact with the Winding

replacing the clamp. If a water-pipe is not handy, a good ground can be obtained by driving a length of pipe into the soil outside of the building; select a damp spot at a point near the window closest to the set, and fasten the clamp to this pipe. Iron rod can be used if pipe is not available. More elaborate grounds can be obtained by burying metal sheets, or if the aerial is of the overhead type and it is possible to use a counterpoise consisting of several wires strung below the aerial, even better results can be obtained. An approved lightning arrester should be used with all types of outside aerials, and it is necessary to use well-insulated wire run through porcelain-tube insulators where the wire enters the building, continuing this wire to



Above, Inspect Tubes for Loose Prongs; Below, See That the Socket Contacts Are Tight

the set. Do not run outside aerials near high-tension wires. If such wires are near the building, run the aerial at right angles to them in all cases. Many humming noises and crackling sounds are attributed to the set which are really caused

by induction from near-by high-tension lines that are paralleling the aerial. If there are other aerial wires on the building, do not run your aerial close to

this is important and will always give better satisfaction in the long run. A well-installed aerial and ground need little attention and pay big dividends in good results.

These things take little longer to do than the time required to tell



Take the Slack Out of the Antenna, and See That the Lead-In Is in Good Condition: Inserts, Soldering and Taping Aerial Joints

them. Keep as far away as possible, and at right angles, if there is room, above or below them. Use good materials;

about them, and the fan who has done them can go ahead with his "DXing" assured that his only enemy will be static.

Finishing a Homemade Loud Speaker

Although it may be very efficient, the average homemade speaker is a bit unfinished in appearance. If made of metal, cardboard or wood it can be very attractively finished by using either the clipped-wool or the blistered effect so often seen. The latter is a little easier to keep clean.

To make the blistered effect, a glue and whiting "dope" is used. This dope is made in the following way: First mix 10 parts of finest gilders' whiting with cold water until a thick cream is formed; to this, add

6 parts of liquid glue. In another container, white damar turpentine varnish, 1 part, is mixed with 4 parts of raw linseed oil. The two parts are then mixed and cooked 10 minutes in a double cooker. When cool, the mixture should have the consistency of very soft butter. Pour this into a wide-mouthed jar and use the following day. This dope is the old foundation for polychrome work and works better after standing for a day.

The speaker should first be given a thorough application of shellac; uncovered spots will not hold the polychrome dope.

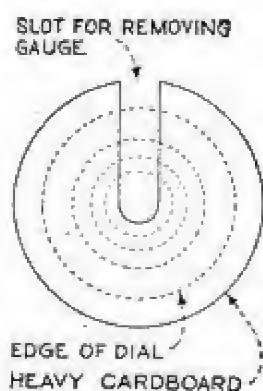
The dope, if of the right consistency, will flow from the brush. If it is too thick, add water drop by drop, and if it is too thin, set the jar, with the lid off, in hot water to evaporate some liquid.

Spread the dope over the speaker with a spatula or broad soft brush. It is best to do one side at a time, as it is a pretty sticky job. Go over the inside surface with a tapping motion. This must be done until the surface assumes a blistered effect. The coating should be allowed to dry for two or three days and the outside is then treated. After drying another three days, the whole surface is given a coat of shellac. For the final finish the speaker may be given two or three coats of colored varnish or of flat paint, to match the interior of the room.

The clipped-wool finish is a little easier and more quickly done. The speaker is first given a coat of shellac and, when dry, is given a rather heavy coat of turpentine damar varnish on the inside. This is a very sticky job. While still very wet, sift on the varnish sign painters' flock. Apply the flock until the surface is evenly covered. This will give a velvety surface that is very good. When perfectly dry, finish the outside of the trumpet in the same manner. If the soft finish is not wanted, a semi-glossy effect can be had by painting over with a thin varnish, after the varnish holding the flock has dried. Do not attempt to hurry the work.

Spacing Dials from Panel

A simple form for spacing the dial from the panel when assembling the set, aids the builder to maintain an equal distance between the dial and panel, at all points. This gauge is made from heavy cardboard and should be large enough to extend about $\frac{1}{2}$ in. beyond the edge of the dial. A slot is then cut to fit around the shaft of the condenser, coupler or variometer, as the case may be. Place the gauge on the shaft next to the panel, and then fit the dial against the form and tighten the setscrew. Then pull out the cardboard. By using this method all dials will be correctly spaced, and will not rub against the panel when rotated.—H. Ray Eaton, Pittsfield, Mass.



Simple Insulator and Mounting for Inside Aerial

An easily made and efficient insulator for the indoor antenna is shown in the illustration. A short length of ebonite or



Simple Indoor Aerial Supported by Ebonite Rods; Lower Right, Detail of Construction

bakelite rod is filed flat at the ends; next, holes are drilled through its center and slanting slots sawed from the outside to the holes on what will be the inside when mounted, as shown in the detail. The edges of the slots are rounded so that the wire will not bend at sharp angles.

As distance pieces between the wall and the rod, porcelain insulators of the common commercial type are used. The latter should be long enough to keep the wire several inches from the wall, the mounting screws passing through the ends of the ebonite rod and the insulators. A triangular aerial, as shown in the illustration, uses a minimum number of insulators, and gives the greatest length of aerial wire. In addition, such an aerial is non-directional, and receives equally well from all directions. The aerial should be kept about one foot below the ceiling, or even more if it can be arranged.—C. A. Oldroyd, Barrow-in-Furness, Eng.

Ⓢ A wavelength of only 6 ft. has been used by station FL, Eiffel tower, France, successfully over a distance of two miles. The antenna current used did not exceed 30 milliamperes. It was found that these short wavelengths were free from static disturbances.



**Great Range, Ease in Tuning and Simplicity of Construction
Also Feature 1926 Model Set**

By F. L. BRITTIN

THE instrument described in this article is a further development of the well-known Popular Mechanics' Superheterodyne Eight, which has given real satisfaction to thousands of fans both in this country and abroad. Practically all the parts are the same, but the circuit has been greatly improved, and a resistance-coupled amplifier replaces the a.f. transformers, resulting in even better tonal qualities. The new model sets a standard for volume, range, tone and selectivity that will be difficult to surpass for some time, and gives the broadcast listener a new conception of what receivers should be.

Simplicity of design makes the new set especially interesting to those with limited experience. The front panel and subpanel are larger than in the former set, providing ample room for the instruments, which are so arranged that shielding is unnecessary. Before attempting to build the instrument, look over the diagrams carefully and provide all parts just as specified in the material list; take time to do good work and follow the instructions in the order they are given.

The layout for the subpanel is given at the bottom of the opposite page. Place this panel on the table and arrange the instruments in the positions shown in the diagram, with all terminals exactly as indicated; then, holding each instrument firmly in place on the panel, point off each mounting hole with an icepick or other sharp instrument, and before removing the sockets and other instruments from the panel, point off the holes indicated by the white dots. These holes are required for running the leads below the subpanel and only the most important points are indicated, as the other holes can be drilled later, as required. Point off the holes for the mounting brackets and other instruments carefully. All holes in this panel then can be drilled with a No. 27 drill except the three holes for the loop jacks

where $\frac{3}{8}$ -in. holes are required. The subpanel brackets are a standard type that can be obtained from any dealer; these raise the subpanel 2 in. and permit easy wiring under it, resulting in short direct leads. Three brackets are used, one at each end and one reversed and mounted in the center of the panel at the rear. The flat ends of the two end brackets, in which screw holes will be noted, are mounted toward the front and extend $1\frac{3}{8}$ in. beyond the panel; each of these brackets is $\frac{5}{8}$ in. from each end of the panel. The center bracket at the rear is mounted with the flat end flush with the rear edge of the panel. Round-head brass machine screws, 6-32 by $\frac{1}{2}$ in., are used to mount the brackets, as well as for most of the other instruments; screws $1\frac{1}{2}$ in. long will be necessary for the tube sockets and the amplifier unit.

The bracket for mounting the midget condenser is shown in detail in the diagram, also the four small brackets used for mounting the $1\frac{1}{2}$ -volt dry cells; these brackets are all made from a $10\frac{1}{4}$ -in. strip of $\frac{3}{16}$ -in. brass $\frac{1}{2}$ in. wide. The brackets for the $1\frac{1}{2}$ -volt cells are mounted $3\frac{3}{8}$ in. apart and are bent so as to hold the cell tightly in place and make good contact on the cell base and the brass positive terminal at the opposite end. Refer now to the large wiring diagram, and mark these brackets positive and negative in their proper order, so that there will be no error later. The amperite unit, mounted between the second detector and the three-gang socket, is an automatic filament control for the second detector tube, and eliminates a rheostat at this point. The .00025-mfd. condenser is mounted on the metal brackets supplied with the tuned-stage transformer and placed across the secondary terminals; a similar bracket is supplied for the .0005-mfd. grid condenser, which also carries the gridleak in clips; this bracket is mounted on the grid terminal. The A and B-battery binding

POPULAR MECHANICS SUPERHETERODYNE 1926 MODEL

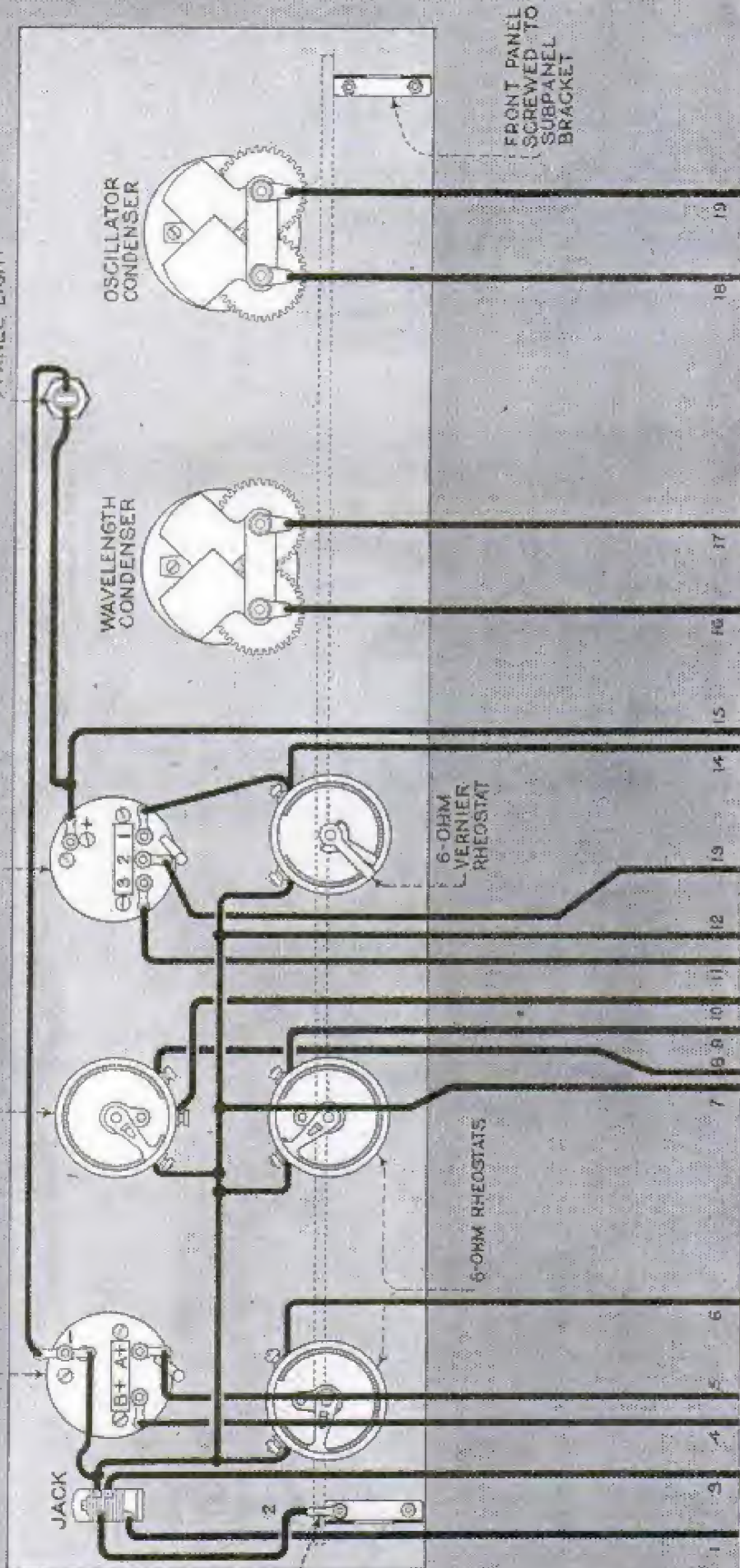
NO. 2 A-LEAD TAKEN FROM
FRONT END OF BRACKET

VOLTMETER
0-7.5V/0-150 V.
A B

POTENTIOMETER

VOLTMETER
0-5 VOLTS
THREE-TAP TYPE

PANEL LIGHT





posts are mounted on the subpanel in the order shown. Mark the 18 and 45-volt B-posts for identification; the other posts can be had with engraved tops. The three-tube amplifier unit is complete and greatly simplifies the wiring; the terminals are plainly marked so there is little chance for error.

All dimensions for the front panel are

plainly shown. This panel should be laid out with care, and it is best to prepare a cardboard template the exact size of the panel. Clamp this to the panel with two or more C-clamps and point off the holes to be drilled carefully, marking the panel deeply so that the drill will not creep and throw the hole out of line. Countersink the holes marked with double circles. For the larger holes, it may be necessary to take the panel to a machine shop, especially for the voltmeter holes.

The front of the panel is shown in the template so it is necessary to refer to the double-page wiring diagram for the rear view of this panel with the instruments mounted in their respective positions. The dotted line indicates the height of the subpanel when the front panel is mounted on the brackets, there being sufficient space between the two panels to clear the rheostats.

The panel light is placed above and between the condensers, serving as a reminder that the

Front View of
Completed
Instrument



tubes are lighted and also as a tuning light for the dials, which is useful at times. The horn jack shown in the upper left-hand corner is detailed in one of the illustrations, and each spring in it is numbered to correspond with the circuit wires to avoid error. This jack functions both as a horn jack and a filament switch: plugging in the horn places the set in operation, and to shut the set off, the plug must be withdrawn, which is a further check on the operator to remind him not to leave the set turned on, needlessly using the batteries when the set is left alone.

This, of course, puts all the tubes in use at once, but volume can be controlled with vernier detector rheostat, if a UV-200 or C-300 tube is used for the first detector, or practically the same result can be had by detuning, if a UV-201A or C-301A tube is used. All other tubes are of the A-type. For those who prefer to operate the set at times with a minimum number of tubes, a simple switching device that can easily be mounted on the front panel will be described in an early issue. The set is now ready for wiring.

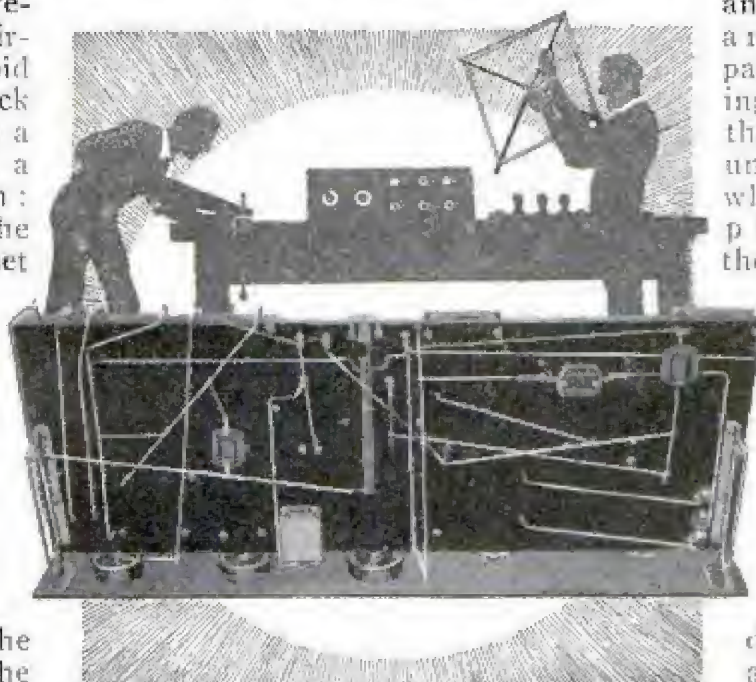
The wiring diagram is as simple as it is possible to make it, and all wires are shown in their exact positions both above and below the subpanel, the panels being separated to show the wiring more clearly. The wires are numbered so that each lead can be easily traced from page to page; the black lines indicate the wires above the subpanel and the dotted lines show the position of the wires below. Wire No. 4, running from the B-positive 135-volt terminal on the amplifier unit to the B-positive terminal on the A and B-battery voltmeter, is a flexible rubber-covered lead. No. 14 round tinned-copper busbar wire being used for the remainder of the circuit. Very little spaghetti insulation is used; only a few short lengths are necessary under the subpanel where wires are likely to be shorted if moved out of place. Soldering lugs are used under every termi-

nal where a wire is to be connected. The lugs are fastened to the small fixed condensers with short brass machine screws. Lugs are very important; do not fail to employ them, and use solid wire solder

and a very small amount of flux paste, carefully wiping the flux off so that it will not run under the terminal when the iron is applied. Note how the wires are run from the instruments on the subpanel down through holes and continuing to their respective terminals. Do not change the direction of these leads under the panel; they

are so placed as to avoid forming loops in the circuit, which would

cause detrimental effects in the set. Several by-pass condensers are mounted below the subpanel, and are indicated by the dotted lines; these condensers are clearly shown in the under-panel photo. Note that the .5-mfd. by-pass condenser is mounted on the underside at the front by means of two short brass machine screws, the soldering terminals extending just beyond the edge of the panel. Now, mount the front panel on the subpanel brackets, place a soldering lug under the nut at the point marked for wire No. 2. This is for the A-negative lead, of which the left-end bracket and the center bracket are a part. Soldering lugs are mounted on the ends of the brackets with short brass machine screws, and the dotted line clearly shows the lead connecting the brackets. The A-negative and B-negative binding posts are connected to each other and then to a lug mounted on the rear end of the center bracket. The 2-in. space below the subpanel provides ample room for all wires without crowding, and leads crossing each other can be well separated. Note the lead running from the negative of the 1½-volt cell to the center loop jack; the center loop lead will be plugged into this jack when the set is hooked up for operation. The A and B-batteries and their connections are so clearly shown that little explanation is



View of Underside of Panel; Note the Position of the Condensers

necessary. The B-batteries should be of the large 45-volt type, and are connected in series to obtain a total of 135 volts for



Side View of Jack, with Springs Numbered to Correspond to Diagram

the amplifier unit, the 18 and 45-volt taps being taken from the first 45-volt unit as shown. Note that the B-negative post on the amplifier unit has no connection. The loop may be of any good make, but must be provided with a center lead. Flexible, well-insulated leads not over 3 ft. long—shorter if possible—are connected to the loop. These leads terminate in small plugs of the cord-tip type, and are plugged into the loop jacks, the center lead to the center jack. Plug in the horn and place one tube successively in each socket, after connecting the batteries, turning up the rheostats to see that the filament circuit is correctly wired. Facing the set, the audio rheostat is the one on the extreme right; it controls the filament voltage for the amplifier tubes only. This voltage can be checked by point 3 on the three-tap voltmeter. The second detector tube is automatically controlled by the amperite, and the center rheostat is for the oscillator tube and three intermediate-frequency tubes in the three-gang socket; this voltage is checked on point 2 of the voltmeter. The first detector tube is controlled by the vernier rheostat and is checked at point 1 on the voltmeter. After testing the filament circuit, place

all of the tubes in the sockets, and the set is ready for operation.

Operating a superheterodyne receiver correctly, so as to obtain maximum results, requires a little practice. This is true of any highly developed instrument—the experienced operator has the advantage; however, the operation of the instrument is so simple that anyone can soon tune in stations at surprising distances with good tone and volume. Set the rotor of the coupling unit at an angle of about 45° , and the set can be adjusted under operating conditions. Set the pointer knobs of all rheostats so that the rheostat is at the off position when turned to the extreme left. A small setscrew in the knob is then tightened on the shaft, and the pointer on the potentiometer knob is fastened in the same manner. To tune in a station, first set the potentiometer about one quarter of the way up from the lower-left side, then turn up the rheostats slowly, keeping the pointers at approximately the same position, and continue until you hear a soft hum from the tubes. Second, set the wavelength condenser at any given point, say 30° , and rotate the dial of the oscillator condenser very slowly 10 to 15° on each side of the 30° mark; if a click or whistle, indicating the presence of waves from a station, is heard, but the words or music is not clear, turn up the detector rheostat slightly, or shift the potentiometer either forward or back, to clear the signal. The potentiometer will have a certain setting where all stations come in best, this point always being found to the left of center. The rheostats will also have a more or less fixed setting that will give the best results, and the tuning is then almost entirely confined to the condenser dials. Third, if nothing is picked up at the first setting of the condensers, move the wavelength condenser up 10° , and again rotate the oscillator dial slowly as before on either side of the 40° mark, continuing this process until a station is picked up. Shift the position of the loop from time to time, as this will often enable stations to be picked up that otherwise would not be heard. When a distant station is picked up and tuned in to best advantage, set the little midget condenser to the point where the signals come in with the best volume and clarity; also make any slight adjustment of the coupling unit rotor that may be necessary to get the loosest coupling without approaching the breaking-over point too closely.

These last-mentioned adjustments need only be made once, and best results are

obtained if they are left alone after the proper setting is once determined.

Place the set in a cabinet or console having a depth of 12 in. measured from

lighter flexible well-insulated leads for the B-batteries.

A complete set of large blueprints, including full-size panel and subpanel drill-

MATERIAL LIST

- | | |
|---|--|
| 1 bakelite or formica panel, 3-16 by 8 by 30 in. | 1 No. 855 Chelton midjet condenser, low-loss. |
| 1 bakelite or formica subpanel, 3-16 by 10 by 29 in. | 1 Daven super-amplifier unit complete (three-stage). |
| 1 bakelite strip, 3-16 by $\frac{5}{8}$ by $1\frac{1}{4}$ in. | 1 No. 55 Jewell voltmeter, 0 to 8 volts only, three-tap type. |
| 1 brass strip, 1-16 by $\frac{1}{2}$ in., $10\frac{1}{4}$ in. long. | 1 No. 55 Jewell voltmeter, A and B-type, 0 to 7.5; 0 to 150 volts. |
| 3 Benjamin subpanel brackets. | 1 loop aerial, three-tap, (box-type preferred). |
| 3 No. 600 Remler intermediate-frequency transformers. | 1 panel light. |
| 1 No. 610 Remler tuned-stage transformer. | 1 2-meg. gridleak, cartridge type. |
| 1 No. 620 Remler coupling unit. | 1 Sangamo condenser, .0005 mfd., with gridleak clips. |
| 2 No. 631 Remler .0005-mfd. capacity unit, complete with dials. | 3 Sangamo condensers, .0025 mfd. |
| 1 three-gang, shock-absorber type socket unit, standard base. | 1 Sangamo condenser, .006 mfd. |
| 3 single shock-absorber type sockets, standard base. | 1 Sangamo condenser, .00025 mfd. |
| 2 6-ohm rheostats, plain, one-hole mounting. | 1 Dubilier by-pass condenser, 0.5 mfd. |
| 1 6-ohm rheostat, vernier, one-hole mounting. | 2 $1\frac{1}{2}$ -volt dry cells (large size). |
| 1 400-ohm potentiometer, one-hole mounting. | 5 binding posts with engraved tops. |
| 1 filament-control jack. 1 1-A amperite. | 3 cord-tip jacks and plugs. |

the front panel to the rear partition, drilling holes through the rear of the cabinet for the loop and battery leads; bore the holes for the leads about 1 in. apart. Use heavy, flexible rubber-covered auto-ignition wire for the A-battery leads, and

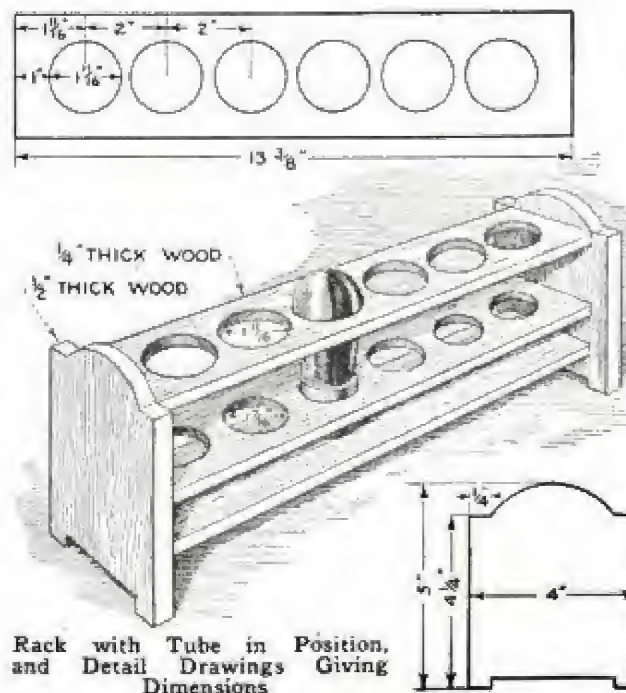
ing templates, instrument layout, and wiring diagram, as well as a schematic diagram of the circuit, may be obtained from the Radio department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago, for 75 cents. Specify blueprint No. 104,

Handy Rack for Spare Tubes

Many good radio tubes have been ruined for lack of a safe place to keep them, and the simply constructed rack described herewith is therefore a worthwhile addition to the experimenter's equipment, and should be used even if the tubes are removed from a set for a few moments only. Anyone can make the rack at very little cost. Three pieces of hardwood, $\frac{1}{4}$ in. thick, 12 in. long and 3 in. wide, are required for the shelves. The position of these is shown in the drawing. The lower shelf serves as a support for the tube base, while the two upper ones are perforated to hold the bulbs snugly in an upright position. The holes in the top shelf are $1\frac{1}{8}$ in. in diameter, and those in the one

below, $1\frac{1}{16}$ in. in diameter. Be sure the holes are spaced properly so that they will line up when the rack is assembled.

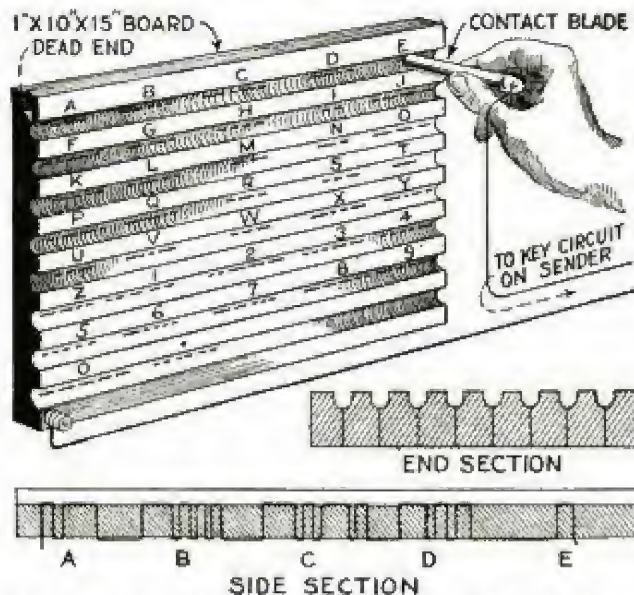
The two endpieces are of $\frac{1}{2}$ -in. stock; these should be 4 in. wide and 5 in. high at the highest point, the rounded top improving the appearance of the rack. These pieces may be grooved to take the shelves, which are then glued and tacked in place with small brads, or the shelves may be tacked directly to the ends, if preferred. After the rack is assembled, it should be sanded and varnished. It is a good plan to screw the rack to the table.—C. A. Reberger, Roselle Park, N. J.



ⓈThe tone of incoming signals can be improved considerably by shunting the primary of the first audio-frequency amplifying transformer with a fixed condenser of .001 mfd. capacity.

Making a Wireless Signal Board for Code Practice

A radio-signal board for the beginner who is learning the code will prove a great help. With it, the necessity for listening



Wireless Code Board Which Transmits Signals Automatically; the Construction Is Clearly Shown

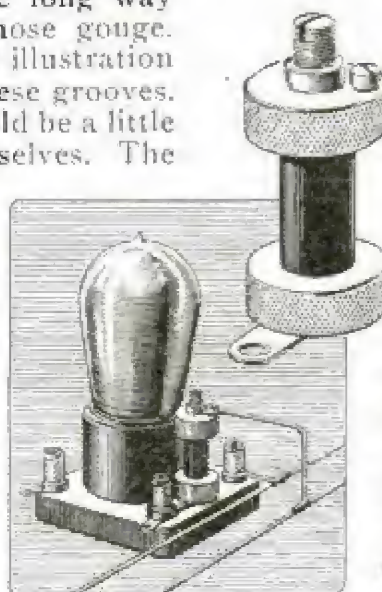
in is eliminated, and the speed can be regulated to suit the operator. A device of this type was used years ago by telegraph operators, and the one described is a simplified form of this, which will meet the need of the radio amateur. It can be used instead of a key for sending messages if desired, or connected to a buzzer for code practice.

Use a board, 15 in. long, 10 in. wide and 1 in. thick, preferably of oak or ash. Lay off eight parallel grooves, the long way of the board, with a round-nose gouge. The end section given in the illustration shows the relative depth of these grooves. The spaces between them should be a little wider than the grooves themselves. The wireless signals are made up of dots and dashes, so the idea is to arrange long and short metal contacts in the grooves to correspond with the individual code signals. This is done by threading soft copper wire through the board as indicated. For this purpose, mark off the dots and dashes in the grooves. Five characters to a line will be about right; then mark the character itself in ink above the groove. Thus A, B, C, D and E will be written along the top of the board, and the corresponding characters will be drawn in pencil in the groove below them.

Now, with a small drill, bore vertically through the wood at the ends of each dash and dot, being careful to keep the holes apart through their entire depth. The board is now ready for wiring. Starting at A, push the end of the wire up through the first hole from the bottom and down through the second. This makes a short line or dot. Then push the wire up again in the next hole and down through the following. This makes a dash, and with the previous dot forms the code signal for the letter "A." Continue this threading process throughout the entire board, pulling the wire taut at all times and flattening it in the grooves with a dull tool. The end of the wire should come out at the lower left-hand corner of the board where it is fastened to a binding post. The end started at A should be left open, or dead. Remember to use one continuous wire throughout.

Connect the binding post to one side of the key or buzzer, and the other wire from the circuit to a dull-edged piece of metal, called the contact blade, which should slide freely in the grooves. It should also be insulated for part of its length to form a finger hold for the operator. With the circuit ready for sending, simply draw the blade slowly across the contacts under the letter to be transmitted. Its longer or shorter contact with the wire in the groove means a dot or a dash, automatically sending the letters.

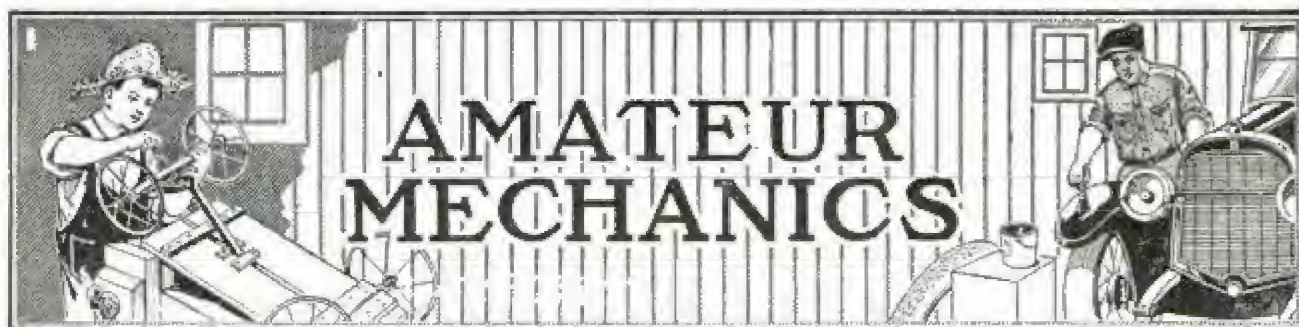
Adjustable Resistance Unit Replaces Amplifier Rheostats



A simple adjustable resistance unit that can be used instead of rheostats mounted on the panel is now available. It simplifies the operation of the set by eliminating panel-controlled rheostats, and being mounted upright on the filament post of the tube socket, as shown in the illustration, takes very little space. The upper view shows the unit in detail. The adjustment can be instantly changed to suit any tube, the resistance ranging from .2 to 35 ohms.

⌚ A pair of electrician's tweezers are a convenience in keeping the tops of storage batteries dry, when used with cotton batting and weak ammonia. They are especially useful when cleaning under the lugs of B-batteries.

*Get 1909 Victory Model
The Control 1011*



Building a Monorail Coaster

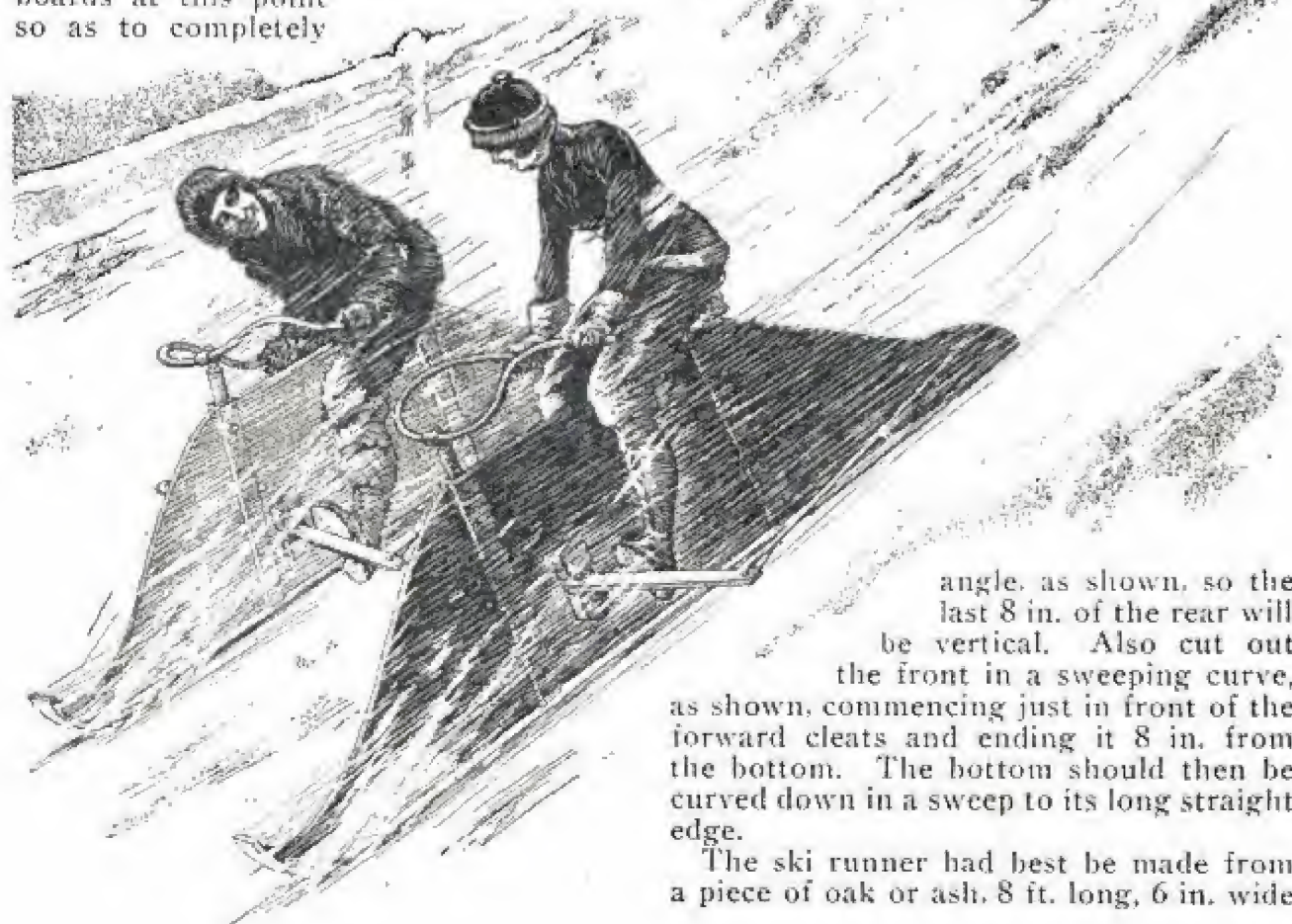
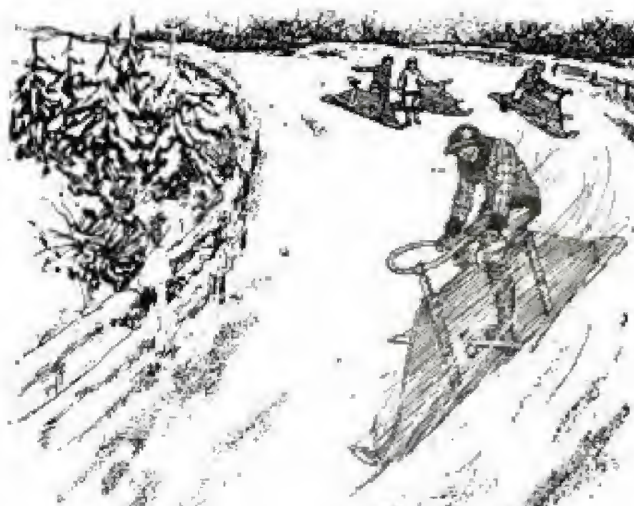
By L. B. ROBBINS

HERE is a winter coasting device that is a sort of combination ski and bicycle. It is used for running down long, smooth snow-covered hills and will afford much fun for the lover of speed.

The body of the coaster is made by cleating together several smooth, matched spruce boards, 7 ft. long. Their width is immaterial but the total width should be about 30 in. First put on the two back cleats, one on each side, with screws. Place these at right angles to the edges and 24 in. from one end. Let these two cleats project beyond the top edge about 3 in.

Now, 30 in. ahead of these cleats, saw a vertical notch down through the top board, for a depth of about 6 in., and make it 1 in. wide. This is for the handlebar post. Then screw two cleats over the boards at this point so as to completely

cover the notch. Be sure to draw the boards well together before cleating and to countersink the screw heads. Then saw the rear ends of the boards off at an



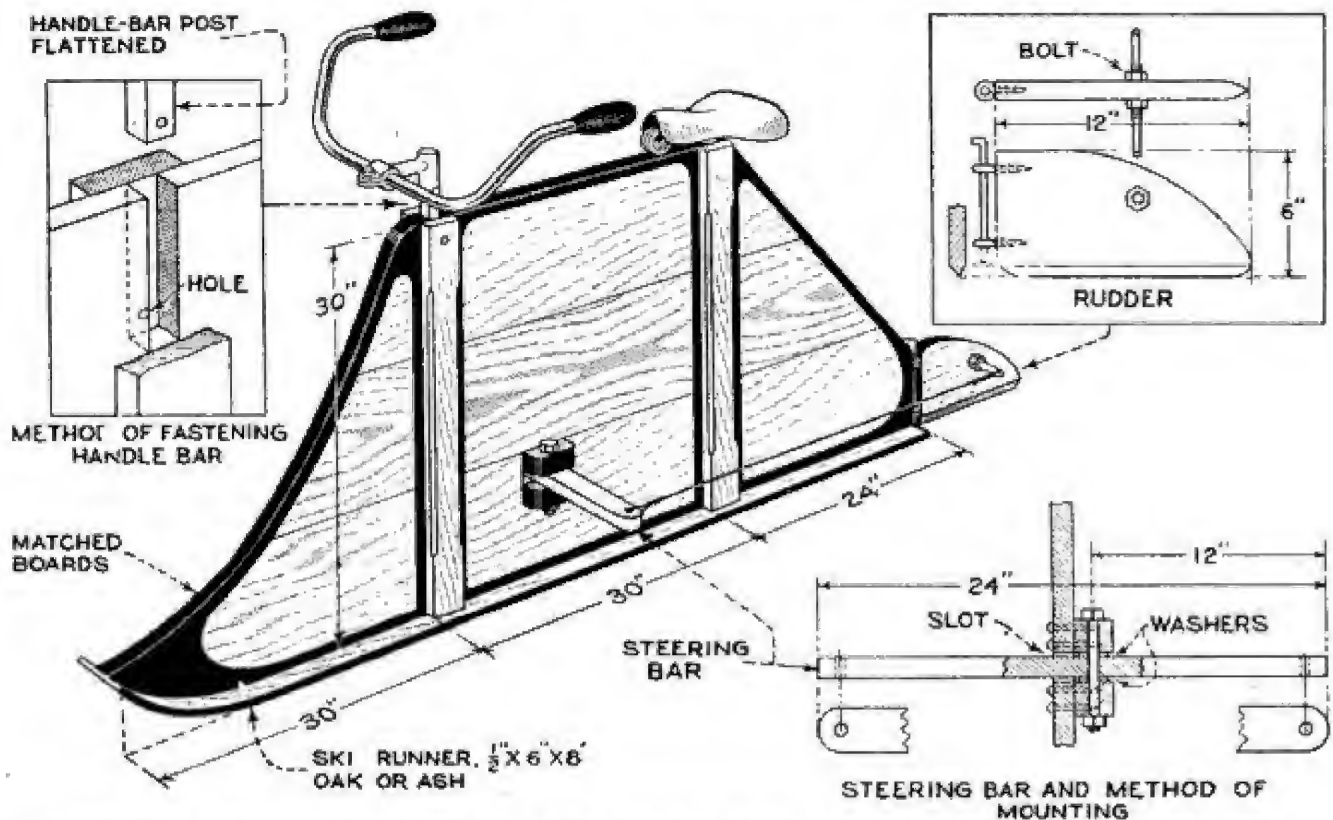
angle, as shown, so the last 8 in. of the rear will be vertical. Also cut out the front in a sweeping curve, as shown, commencing just in front of the forward cleats and ending it 8 in. from the bottom. The bottom should then be curved down in a sweep to its long straight edge.

The ski runner had best be made from a piece of oak or ash, 8 ft. long, 6 in. wide

and $\frac{1}{2}$ in. thick. Fasten it to the bottom edge of the body with brass screws, countersinking the heads only slightly. The back end should be flush with rear of the body, but the front end should project up and beyond the point. This curve is

hole in the steering bar. Be sure to have the 11-in. end of the bar on the blocked side of the body.

The rudder is cut out of a piece of hardwood, 12 in. long and 6 in. wide, to the shape shown in the detail. Sharpen



Construction Details of the Coaster; the Handlebars and Saddle of an Old Bicycle Are Used and a Foot-Steering Arrangement Is Provided

easily obtained if the wood is steamed or soaked in boiling water before attempting to fasten in place. Sandpaper the runner smooth and oil with linseed oil.

The handlebars can be taken from an old bicycle. Flatten the post so it will fit down in the notch in the body and drill a hole through it and corresponding holes through the cleats for a retaining bolt, to hold it steady. The seat may also be an old bicycle saddle and can be bolted to the top between the two rear cleats, as shown. The saddle type used will determine how this should be done.

Then comes the steering arrangement. This consists of an iron bar 24 in. long, 2 in. wide and stiff enough to stand your weight. Have a pivot hole drilled 11 in. from one end and a small hole in each end for the steering cables. Cut a horizontal slot in the body, 10 in. from the bottom, and at a point between the cleats convenient to the feet when sitting in the saddle. Bolt two hardwood blocks above and below this slot and drill a hole down through them. This is a pivot hole for a long bolt, which should be driven down through the blocks and through the pivot

the bottom edge and fasten a long bolt through the middle, near the top edge. Drive a pair of heavy screweyes into the vertical edge of the rudder to fit close to another pair in the end of the body. A steel pin, run through the screweyes, allows the rudder to swing from side to side. Drill a hole in each end of the bolt and connect them to the ends of the steering bar, as shown. Use small steel wire and line the rudder up so it will be exactly in line with the runner when the bar is at right angles to the body.

Give the entire body two or three coats of bright-colored paint, to protect it from moisture and give a sporty appearance.

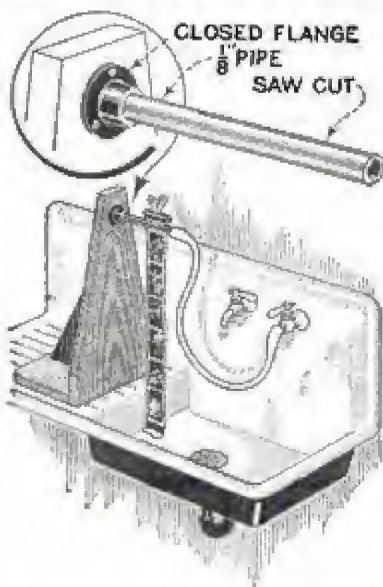
Starting from the crest of a long hill, this monorail coaster is ridden exactly like a bicycle except that the steering is done with the feet on the steering bar. A slight movement either way moves the rudder and changes the course of the coaster. Be careful of attempting to take too sharp curves however. The best speed can be realized by wearing a hard-packed path down the slope by several descents and following this track as closely as possible in all later trips.

Nickelplating by Friction

In nickelplating iron, a thin coating of copper can first be produced on it by rubbing on a solution of 20 parts of sulphate of copper, 5 parts of sulphuric acid and 100 parts of water. After the copper plate has been formed rub over it, with a rag, a solution of 3 parts tin, 6 parts nickel and 1 part iron in 100 parts of hydrochloric acid and 3 parts of sulphuric acid. If finally the object is rubbed with a rag that has been dipped in finely pulverized zinc, a nickel deposit will be made on the copper. The thickness of the nickel deposit can be increased by repeating the two last operations. A silver coating can be produced by dissolving freshly precipitated chloride of silver in a solution of hyposulphite of soda, 1.1 parts to 10 parts of water, and adding to this solution 180 parts spirits of sal ammoniac and then stirring in 800 parts of finely washed chalk. This mixture is applied and rubbed until it dries on the object being silvered, and the result is a brilliant deposit of pure silver.

Holder for Washing Photographic Films

Photographic films can be effectively washed in the sink by means of the simple device shown in the illustration. A short



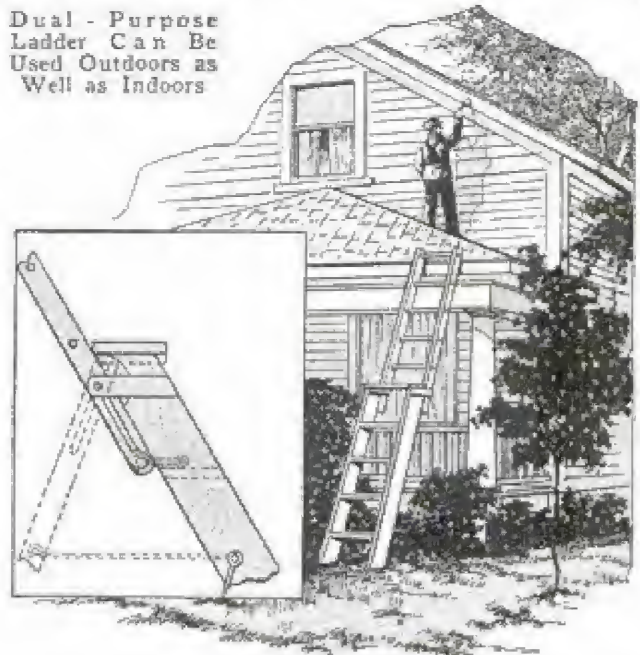
length of $\frac{1}{8}$ -in. pipe, threaded at one end, a $\frac{1}{8}$ -in. pipe flange and a section of rubber hose are the only materials needed. With the hacksaw, cut a slot, lengthwise through the pipe, about 1 in. greater than the width of the largest film to be

washed, as shown in the detail. Screw the pipe into the flange and fasten this to a wooden standard which should be high enough to permit the film to hang down into the sink without touching the bottom. The film is held with a clip. A length of rubber tubing is slipped onto the water faucet and over the end of the pipe and the water is then allowed to run slowly. It will flow down both sides of the film and clean it thoroughly.—Harold Nowell Whitmore, Cleveland, Ohio.

Folding Stepladder Extension

A stepladder that can be opened up so that it becomes almost twice as long, is a convenient part of the household equip-

Dual - Purpose
Ladder Can Be
Used Outdoors as
Well as Indoors



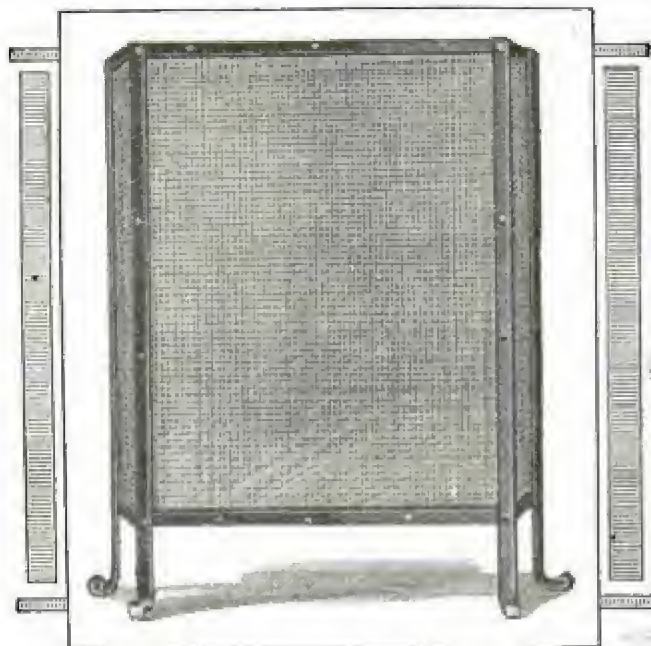
ment. As shown in the drawing, half of the ladder is part of an ordinary stepladder, and the second half is simply a short ladder of the usual type. The two sections are joined by means of two metal straps with a rung between them on which the top ladder slides in slots cut in the rails. A hook attached to the lower half is swung out to slip over the bottom rung of the upper half to hold it rigid when extended.—A. C. Cole, Chicago, Ill.

Cleaning Center-Guide Float in Carburetor

Many carburetors are fitted with hollow metal floats having a tube through the center. The inlet needle works in this tube and any roughness or dirt here will cause trouble by too high or too low a fuel level. A good method of cleaning out the inside of the tube is to remove the float and draw a rag soaked in metal polish through it. Repeat this several times and then draw a dry rag through the tube. If the opening is still rough, roll up a piece of very fine sandpaper or emery cloth, insert it in the tube and pull this back and forth until the surface is smooth. Finish by using metal polish on a rag. The inlet needle should also be treated with metal polish. Care should be taken when using sandpaper in the tube through the float, as any holes made here would allow the float to fill with gasoline.—E. T. Gunderson, Jr., Humboldt, Iowa.

Making a Fireplace Screen

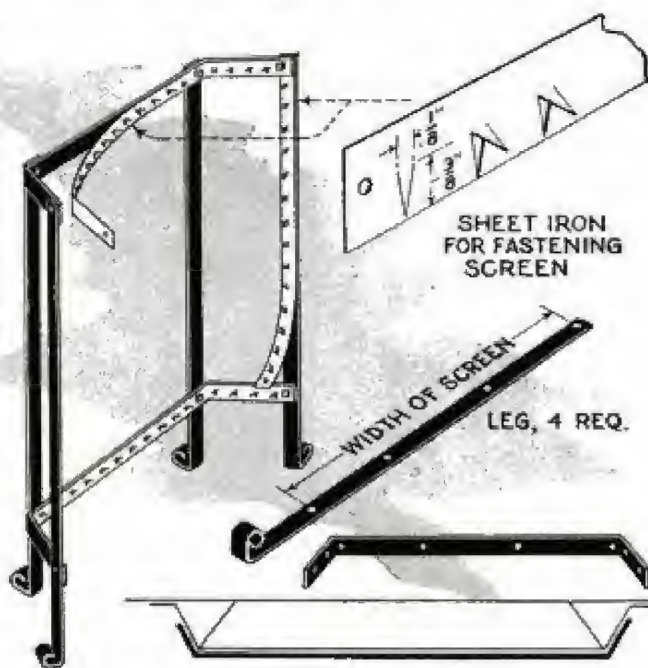
Sparks from fireplaces sometimes set houses afire and frequently cause other



Fireplace Screen Made from Strips of Flat Metal, Sheet Metal and Copper Screen

accidents. This danger could be greatly reduced if fireplaces were protected with screens. These can be purchased or made at home; the one shown in the photo and illustration is simple in construction and can readily be made by anyone who is handy with tools. The frame is made of $\frac{3}{16}$ by $\frac{3}{4}$ -in. bar iron, which can be obtained from a blacksmith or a hardware dealer. With a hacksaw, cut off four lengths for legs, making each leg 4 in. longer than the height required for the frame. Form a foot on one end of each, as shown. This can be done by heating the iron, then clamping it in a vise and bending and hammering it into shape. The legs must, of course, be uniform in shape and dimensions. Drill $\frac{1}{4}$ -in. holes in each to receive stove bolts with which crosspieces are attached, the length of which is determined by the width of the fireplace. If there is a projecting hood above the opening the screen should be bent to conform to its shape as shown in the lower right-hand detail. In any case it should be bent approximately to the form shown, making the front legs project forward at least 4 in. beyond the rear ones so that the screen will stand securely. Cut strips of 24 or 26-gauge sheet iron about $\frac{3}{4}$ in. wide. With tin snips one edge of these strips is cut to form points, as shown. Bend these points up at right angles and attach the strips to

the crosspieces and to the end legs as indicated. It is then an easy matter to attach some copper screen by slipping it over these points and then bending the points over. Be sure that the screen is drawn up straight and true. It is held stretched and smooth by $\frac{1}{2}$ by $\frac{1}{8}$ -in. iron bars, cut to fit over the strips of sheet metal holding the screen, holes being drilled through the bars to fit over the stove bolts. The projecting edges of the screen are carefully trimmed off and the rough edges and corners of the metal



FIREPLACE HOOD

strips filed down.—Howard E. Good, Waterville, Ohio.

Copper Stencil for Marking Laundry

A stencil suitable for marking laundry may be easily made as follows: Obtain a small sheet of very thin sheet copper, about 1 in. wide, and 4 in. long. Dip this in a vessel containing some melted beeswax so that both sides will be evenly covered with a thin coat when it cools. The design, name, monogram or figure that is wanted in the stencil should now be drawn upon a piece of thin white paper, the reverse side of the paper blackened with graphite, and then laid on the stencil plate with the design in the center of the plate, whereupon the design is lightly traced with a blunt point on the thin wax coating. After the paper is removed, trace the design on the wax surface with a pointed instrument, but not completely, the lines being broken at more or less regular intervals, to form holders so that, after etching, the design cannot fall out.

Next lay the stencil in a shallow dish and pour a small quantity of fresh nitric acid over it. Keep the air bubbles removed from the surface of the sheet by means of a piece of soft feather or brush. The design will be eaten out in a very short time where the wax has been removed, and this may be readily observed by holding the stencil plate up to the light. The acid should then be rinsed off with water, and the wax removed by heating and wiping it off with a cloth. The stencil may be given a final cleaning in a dish of benzine or gasoline, which will remove any remaining wax.

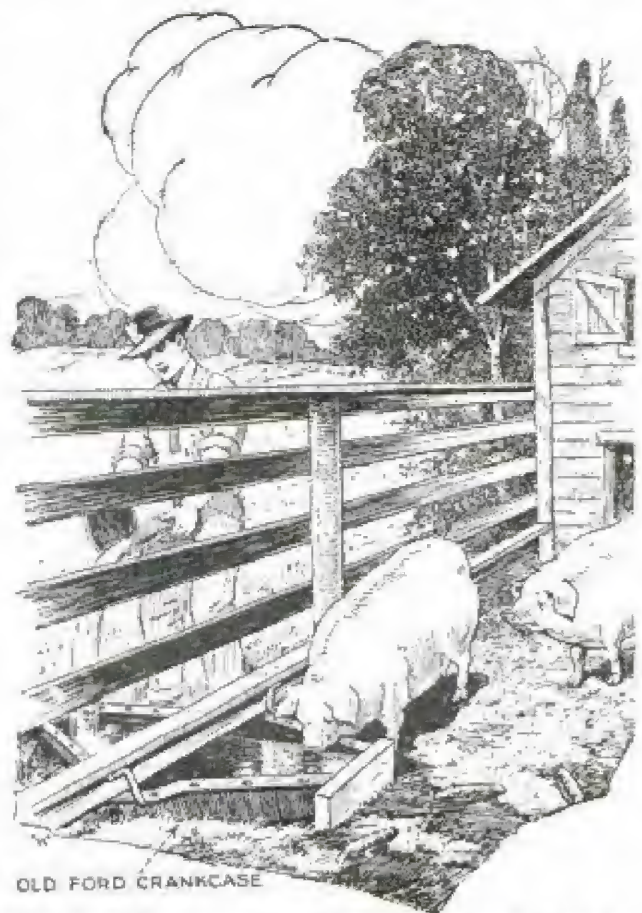
Novelty Lampshade Revolves on Stand

A lampshade turned by the heat from the bulb can readily be made for the type of electric lamp in which the bulb is mounted upright at the top of a supporting base. Remove the regular shade and replace it with a special shade made of fairly transparent parchment or colored bond paper. This shade may be made either cylindrical or square. The top of the shade is of cardboard, and is cut so that it has small blades or fans like those of a windmill wheel. The center has a dent punched in it to rest upon the small tip of the bulb. Thus mounted, there is almost no friction and the rising heat from the lamp through the fan blades of the top causes the shade to revolve slowly. Figures can be cut from black paper and pasted to the shade or



Novel Parchment Lampshade Which Is Rotated by Rising Heat from the Lamp

other light ornamentation of the kind shown may be added and will make it quite attractive.



OLD FORD CRANKCASE

Old Ford Crankcase Used for Feeding and Watering Hogs

Crankcase Makes Hog Trough

Instead of throwing away an old discarded Ford crankcase, one farmer made use of it as a trough for watering and feeding his hogs. A small hole is dug in the ground under the fence to receive the crankcase, the narrow end of which projects outside of the hog yard. This arrangement enables the farmer to pour the slops into the crankcase without spattering it on his clothes or having the pigs rub their snouts against his shoes.

Locating Breaks in Tire Casing

Breaks on the inside of tire casing that are large enough to wear the inner tube, are sometimes difficult to find when the tire is removed from the wheel. It is a good plan to roll the casing by hand on the floor, bearing down on it heavily. This gives the effect of a tire about half down, and causes breaks on the interior to show up plainly inside of the flattened portion. This is a good method to use with small tires, but larger tires are usually too stiff to be flattened in this way.—E. T. Gunderson, Jr., Humboldt, Ia.

When you have a hole in your pocket turn the pocket inside out and cover the hole with adhesive tape.

Operating Heating

Home Plant Will Repay by Reducing Cost



Feed the Coal Properly to the Firebox if Best Results Are to Be Obtained

TO keep the cost of heating the home low, while at the same time keeping the house comfortable, demands that the operator understand his plant. Simply filling the firebox with coal and removing the ashes whenever they accumulate, is not enough. Every owner should learn to regulate his heater so that it will follow the changes in outside temperature, and so that the fuel will be burned efficiently.

The thing that is most neglected about the average plant is the proper use of the

dampers. There are usually four on the furnace; the draft damper, the feed-door damper, the check damper and the smoke-pipe damper. The draft damper is generally a small lift door or slide in the ash-pit door, which admits almost all the air that makes the furnace burn. The check damper is usually fitted in an elbow in the smoke pipe, and, by opening this, cold air is admitted to the smoke pipe, reducing the draft in the chimney and slowing up the burning of the fuel in the firebox. This damper should always be closed tight whenever new fuel is added to the



The Feed-Door Damper, Which Supplies Air above the Fire, to Aid in Combustion



There Are Two Draft Dampers in This Ashpit Door, for Better Regulation

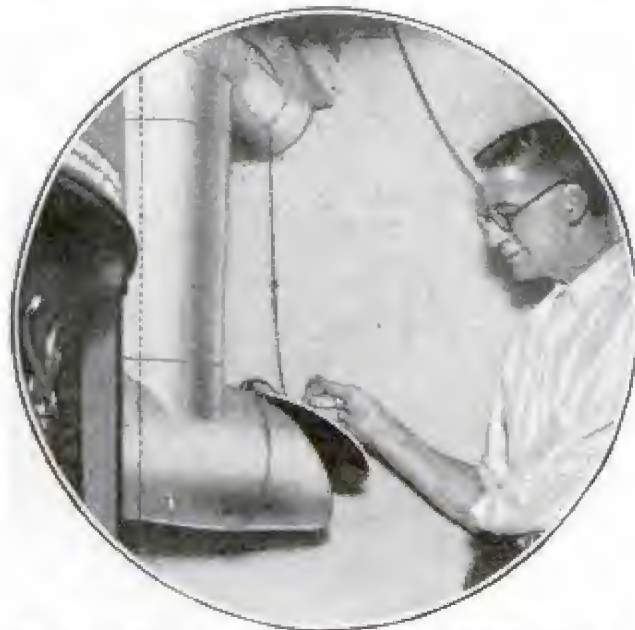
fire. The feed-door damper, which is usually a small slide in the door leading to the firebox, is more important than is usually supposed; cold air may be admitted through it directly over the fire, and if it is opened wide, it acts as a check. If properly regulated, it admits just enough air to supplement that admitted through the draft damper, and is a great aid in inducing perfect combustion of the coal. The smoke-pipe damper is not always fitted, but with a chimney having a strong draft, it is of great assistance, as it provides better control of the draft than the check damper can alone, especially in windy weather or at night. It should always be fitted between the furnace and

the Home Furnace

Study of Its Little Ways of Heating House

the check damper, never between the check damper and the chimney flue, as it is sometimes found. Soft-coal furnaces are fitted with another damper, known as the hot-blast damper, connecting with an air chamber for admitting hot air above the fire.

When starting the fire, place some light material in the firepot and a little heavier wood on top; then open the draft damper wide, close the check and feed-door dampers and set the smoke-pipe damper so that the wood burns well, but not too fast. When it is burning briskly, throw on some



The Check Damper in the Smoke Pipe, Which Reduces the Draft in the Chimney

coal, spreading it well over the burning wood. Do not throw on too much at one time, and see that the fire continues to burn well. If blue flames spring up all over the surface of the coal when the feed door is opened, open the feed-door damper to admit enough air to burn off the gases arising from the top of the coal. When the blue flames disappear, close the feed-door damper and allow the fire to burn until the desired temperature of the house has been reached. The draft damper should then be closed and the check damper opened until the fire seems to "stand still"; it may be found necessary to let the draft damper stand open slightly, in fact, it will usually be found



Sprinkle the Ashes before Removal from the Basement, but Not too Much

necessary to experiment with the check and draft dampers until the position is found for each that will hold the fire at the desired point. It is usual to have the check damper connected by means of a chain to a regulator on the floor above, so that the fire can be checked or increased without the necessity of going down to the furnace, and, while this is a convenience, an occasional trip should be made downstairs so that the condition of the fire can be observed and proper attention paid to it.



Keep the Ashpit Free from Ashes and Clinkers to Permit the Air to Get to the Fire

When banking the fire for the night, close the check damper and open the draft damper, and allow them to remain in this position until the blue flames over the banking coal or cinders disappear, indicating that the coal is not giving off any more unconsumed gases, then open the check and feed-door dampers and close the draft damper. It may be found advisable to close the smoke-pipe damper entirely, but this is also a matter for experiment, as it depends on the installation, the chimney and the weather. Different grades of coal affect the damper regulation also, as some coals require more air for complete combustion than others. The only way to learn to regulate the dampers is by trial and error, but the process is well worth while, as it will

result in increased economy of operation. A fire should not be shaken down more than three times a day, and twice will usually be found sufficient, in the morning and at night. Care should be taken not to shake it too much, and live coals should not be shaken through the grate. In mild weather an accumulation of ashes can be allowed to lie on the grate. The ashpit is so designed that enough air can pass through it to enable the coal to be burned completely, but this effect cannot be obtained if the ashes are allowed to accumulate in the ashpit until they choke it. Clean out the ashes immediately after shaking, and avoid not only the hindrance to combustion, but also the danger of burned and warped grate bars. Also, the fire should not be shaken until it has had time to catch: after throwing on fresh coal in the morning, open the draft damper and close the check damper, opening



Upper Left, Shake Lightly; Upper Right, Don't Neglect the Water Pan; Below, Sprinkle Ashes in Pit before Removal

also the smoke-pipe damper until the fire is glowing, then shake with a light, quick movement. Do not turn the grate completely over unless it is necessary to re-

move a large clinker. When the first bright cinder is seen to fall through the grate, stop shaking and remove the ashes, sprinkling them a little—not too much—before removing them. A small watering pot kept near the furnace is good for sprinkling the ashes, but the spray nozzle on the hose will answer.

The fire should not be poked unless it is necessary to break up a mass of caking coal to prevent it from fusing over the grate. With large pieces of this character, it is best to pry them to the top of the fire, where they can be broken up and removed through the fire door, rather than to overturn the fire in the attempt to dislodge them through the grate. There must be a good fire on top of the mass before this is attempted, however, or else the fire may have to be coaxled with wood. If there is a good bed of live coals in the fire before the mass is pried to the top, the addition of fresh coal is all that is necessary.

Before removing the ashes to the alley, it is well to sprinkle them a little again to keep down the dust as much as possible.

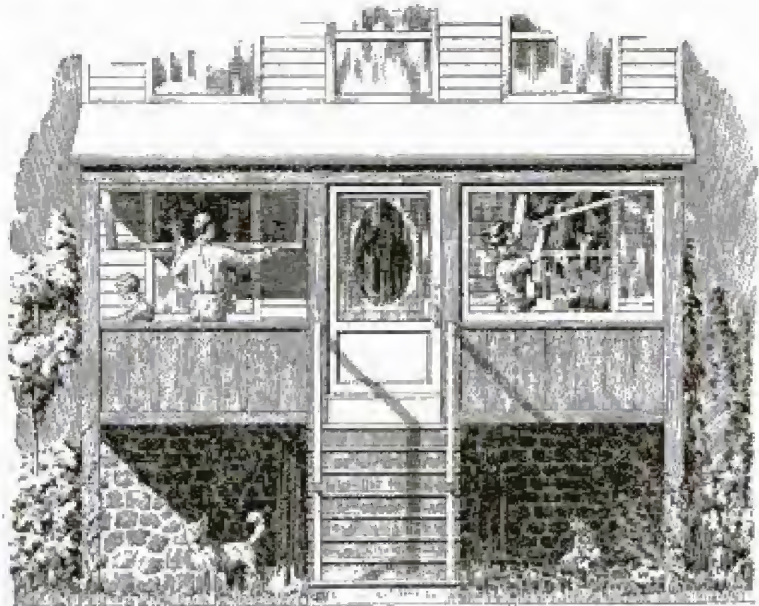
A factor in the cost of heating a house that is little considered is the humidity of the heated air. Most furnaces are fitted with a water pan, but this is usually set so low down in the body of the furnace that it is not of much account. The home mechanic can improve it by moving it up in the furnace so that it is well within the warm-air space, and with its bottom at least 2 in. above the top of the combustion chamber. A supply pipe with a ball stop-cock and an overflow tube makes it easy to keep the pan filled with water.

In an article published in the April, 1925, issue of this magazine the proper method of feeding the coal to the fire was explained, and the reader is referred to this article for full information on the subject.

Retouching fluid can be applied to the negative one drop at a time by using a small oilcan and keeping the opening closed by means of a glass-headed pin.

Hanging Window Sash on Porches

It is a great asset to have the porches inclosed during the winter months. In many cases sash are provided and take



Convenient Method of Hinging Porch Sash Which Permits Hanging Them Up against the Ceiling

the place of the screens which are used in summer. Changing them means considerable work, however, and while stored away, the glass may be broken. To overcome these objections, I had sash made that were hinged at the top, so that they could be raised inward and fastened securely to the porch ceiling with hooks. The screens were fastened on the outside of the porch so that they did not interfere with the sash if it was desired to let them down. When real cold weather starts, the screens are, of course, removed.—Mrs. E. O. Swope, Danville, Pa.

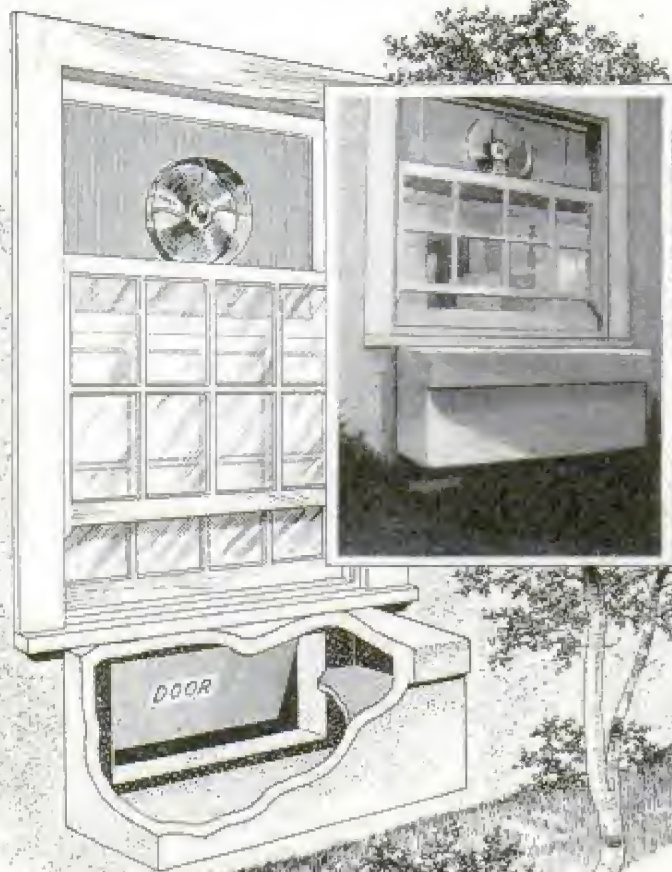
Saving the Dip Net

Where dip nets are used in streams with rocky or gravel beds, the part that surrounds the wire frame soon becomes

worn and frayed. One expert fisherman protected his net by splitting an old inner tube and stitching one half of it over the wire frame, as shown in the drawing. When the rubber begins to show wear, it can easily be replaced.—Dale R. Van Horn, Walton, Nebraska.



Strip from Inner Tube Saves Net from Wear



Concrete Built-In Refrigerator and Electric Fan Are Conveniences That Housewives Appreciate

Concrete Window Refrigerator

Made of concrete, the refrigerator shown in the drawing is a considerable improvement upon the wooden window box, which is quite common. It is built as part of the wall of the house and opens into the kitchen. There is a drop door, the inside of which is heavily padded with heat-resistant material to prevent the heat from the kitchen from getting through to the food. Inside of the box there is the usual shelving. Built as thick as it is, this window box not only serves to keep things cool without freezing during the winter but also helps keep out the heat in summer. If desired, ice can be used.—Felix J. Koch, Cincinnati, Ohio.

How to Make a Humidity Indicator

A simple weather indicator that may be used in determining the condition of the atmosphere is made as follows: Dress a small figure, in the form of a doll, with a piece of cloth, previously dipped in the following solution: Chloride of cobalt, 30 parts by weight; sodium chloride, 15 parts; gum arabic, $7\frac{1}{2}$ parts; calcium chloride, $4\frac{1}{2}$ parts and water, 400 parts. This cloth

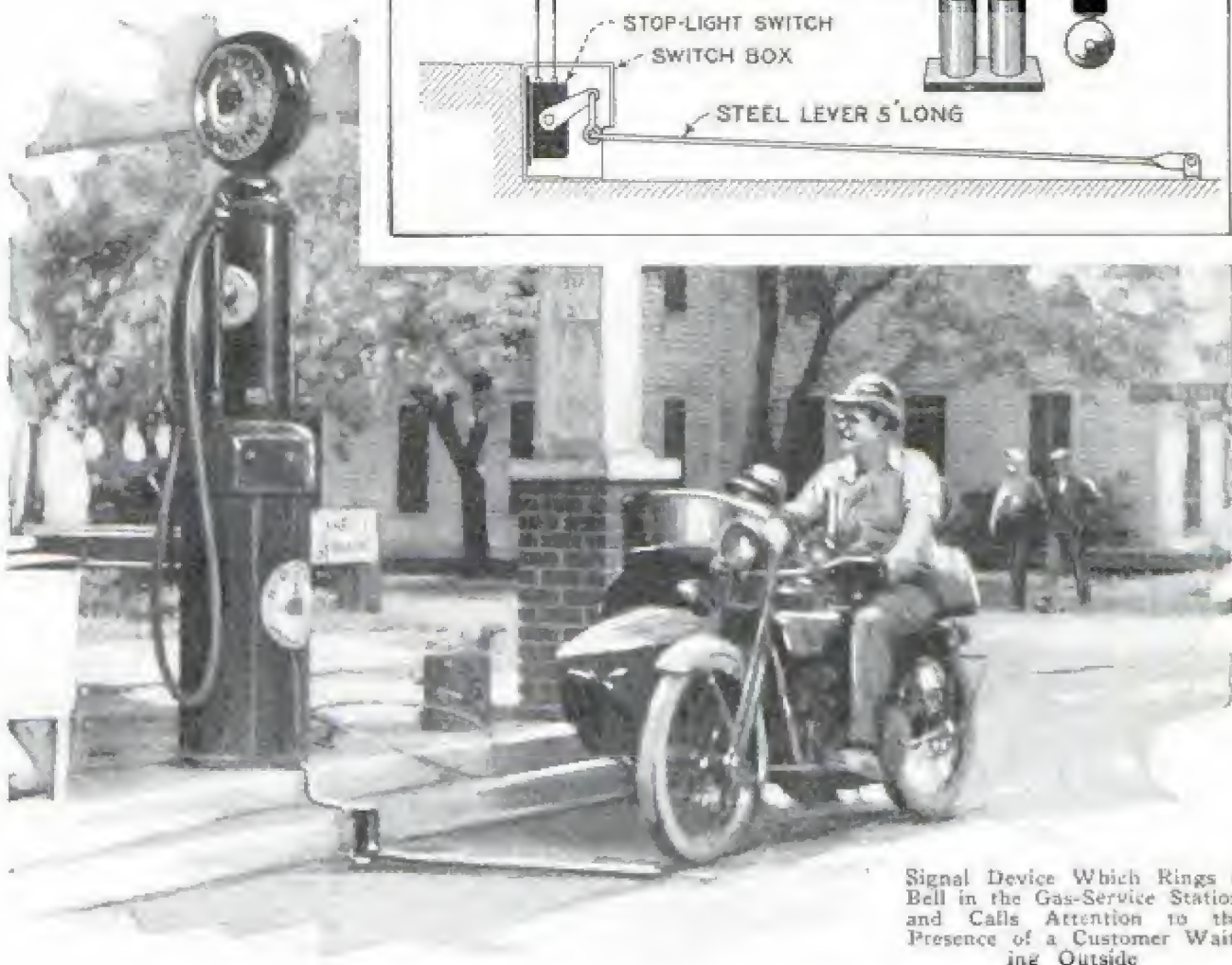
will change color as the amount of moisture in the atmosphere changes, the change being due to the cobalt salt, which, in dry air is lavender blue. As the moisture in the atmosphere increases, the color changes first to bluish red, then light red and finally pink, according to the amount of moisture. With a decrease in moisture, the colors change in the reverse order, and the blue color returns when the air becomes dry.

Sheet-Iron Foot Scraper

If one wishes to depart from the conventional style of foot scraper, here is an idea that may be of value. The scraper can be cut out of sheet iron with a cold chisel, the pattern resembling an animal or bird. In the drawing, one scraper is made in the shape of a dog, the other resembling an owl or parrot. In making them, be sure to use heavy sheet iron, especially if the pattern calls for some of the metal to be cut away at the base. The outline can be drawn on the metal with chalk and then cut out with the chisel. It does not matter if the outline is ragged or a bit irregular, as it can be filed smooth later. As the scrapers are set in concrete blocks, part of the sheet metal underneath the design is allowed to remain so that it can be anchored in the concrete.



Ornamental Foot Scrapers Resembling Animals and Birds Improve the Appearance of the Doorstep



Bell Signal for Service Station

As a signal to call his attention to the presence of a customer, the owner of a gas-service station installed the bell-ringing device shown in the photo. The insert shows the arrangement and wiring diagram. A steel lever about 5 ft. long is laid in the auto track so that the car must ride over it. When this takes place, a switch is closed for an instant and causes a bell to ring, which may be located at any convenient place in the station.—C. O. Cole, Wichita, Kans.

Treating New Paintbrushes

Failure of good paintbrushes to render service usually is due to improper treatment before dipping them into the paint. They should be thoroughly cleaned before they are used. Work them against the hand or a board until all dust and loose hairs are worked out. Then place the brush in clean water and let it remain there until the hairs are well saturated. Finally, shake out all the water and allow the brush to dry. When so treated,

new brushes will last longer and will work better.—L. H. Georger, Buffalo, N. Y.

Wash-Basin Base for Lamp Prevents Fire

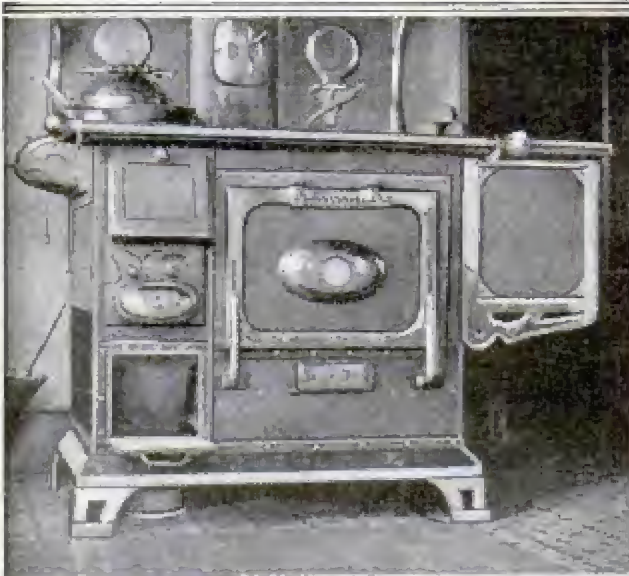
Dangerous fires have been caused by ordinary lanterns accidentally knocked



over. To eliminate this hazard, one farmer mounted his lanterns on ordinary tin wash pans. These provide such a wide base that there is practically no danger of the lantern upsetting. The edges of the lantern base are soldered to the bottom of the wash pan. When soldering, the oil

should, of course, be removed.—L. M. Jordan, Vredenburgh, Ala.

Removing Ashes from Kitchen Stove



Ashes from Kitchen Range Fall Directly into a Large Ash Can Located in the Basement

Removing ashes from the kitchen stove is usually quite a bother, and the ash chute shown in the photo, therefore, will be found a great convenience, as the ashes fall into a can located in the basement under the stove.

The ordinary ash pan is removed, and a stovepipe brought up from the basement, as indicated. A galvanized-iron hopper with sloping sides and a short circular pipe at the bottom takes its place. The short pipe fits in the top of the stovepipe leading to the ash can.

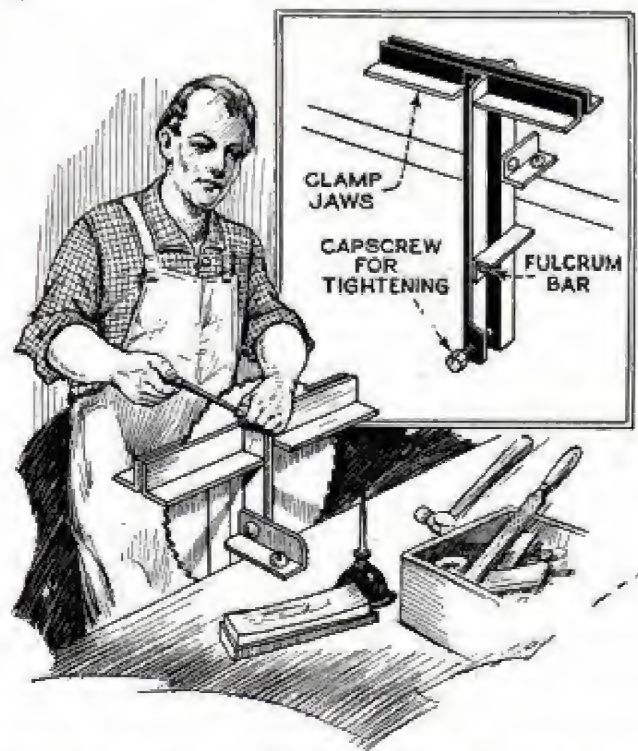
Making Glass Transparencies

A great number of the amateur photographers have made glass transparencies by contact printing, using regular photo plates instead of paper. Few have gone farther than this, either framing or just binding the transparency so that it can be hung up in some location where the light shows through it. A better way is to make the transparency in the usual way and use a clear glass for a backing, placing a sheet of thin, colored tissue paper between the two glasses and then binding

the glasses with gummed tape. In this way different effects can be obtained by using the same view with colored tissue papers, or by placing bright-colored tin foil between the two glasses. When using the tinfoil plan, there will be no transparency from side to side of the photo but from the front only and the picture can be placed in any location where there is light on its surface. The bright foil underneath will bring out the picture clearly.

Saw Vise from Old Bed Rails

An old bed rail, picked up in the junk yard, can be made into a serviceable saw vise by the home mechanic. The horizontal bars, which form the jaws of the vise, are cut 14 in. long, and notched in the center to admit the vertical members. The two sets of bars are drilled and tapped, the holes being countersunk on the inside of the jaws. Draw up the screws tightly, saw off the parts projecting outside of the jaws, and rivet over to prevent loosening. The vertical bars should not exceed 16 in. in length. The fulcrum bar, bolted to both vertical bars, should keep them $\frac{1}{2}$ in. apart. Drill a $1\frac{1}{2}$ -in. hole in the lower end of the outer vertical bar and tap for a $\frac{1}{2}$ by 2-in. capscREW. This, when forced against the opposite bar, brings the jaws together firmly. The fulcrum bar should not be over 10 in. below the jaws. Attach the vise to the workbench with one or preferably two short pieces fixed to the inner vertical bar, as shown.



Useful Saw Vise for the Home Mechanic Made from Old Bed Rails

CONNECTING ELECTRIC ACCESSORIES on the AUTOMOBILE

"WHERE'S J. J.?" asked Bill Smith, alighting from his car at the door of John Jackson's garage. "In the shop," replied Hank. J. J.'s gas and oil attendant and general handy man, as he unlocked the gasoline pump. "Anything I can do for you? You must be in a hurry this morning, you're around so early." "No," replied Bill. "I just want J. J. to wire up my spotlight. You know I've got to go over to Centerville tonight, and J. J. didn't have a spotlight in the house last night, so I bought one over at the hardware store, and they didn't know how to wire it." "You've been driving a car for five years, Bill. Why didn't you wire it up yourself?" broke in a voice behind them, as J. J. strolled out of the garage. "It's an easy job." "Maybe it is, John, but I don't know how to do it," replied Bill. "Well, gimme the works, and I'll show you how it's done, and then when you buy a cigar lighter or some other gadget in another town, where they haven't a good-natured garageman to wire it for you, you can do the job yourself."

"Connecting a spotlight, hand warmer or any other kind of electrical device on the car is extremely simple," said J. J., as he started to work. "Most accessories of this kind have switches of their own, the spotlight usually having a switch in the handle, while a cigar lighter makes its circuit when it is pulled from the socket. Practically all cars nowadays have the single-wire or grounded wiring system, and this also makes the wiring of accessories a simple matter. The first thing to do, of course, is to decide on the position of the accessory, and mount it. Convenience is the thing to be consulted usually in this, and in the case of a cigar lighter, the best position is the one on the dash nearest the driver. It might seem a little discourteous not to mount the lighter nearest the position of the other fellow in the seat, but he has nothing else to do but reach over



Connecting Accessories to the Ford Manifold Terminal Block

and grab it, while the driver has to attend to business, and can't afford to let much else interfere with that.

"Some drivers prefer their spotlight on their own side, where they can adjust it while driving, and others mount it on the right side of the windshield, and adjust it to the side of the road, then let it alone. On the right side, it annoys approaching drivers somewhat less than when on the left, but, on the other hand, it cannot then be used to read signposts or house numbers. For my own part, I prefer it mounted down below the headlights, on the front of the car, and directed on the right-hand edge of the road. In this position it gives the maximum light where it is most wanted, and it cannot glare into an approaching driver's eyes. For reading signs, and that sort of thing, I have another spot mounted on the windshield frame. However, it's all a matter of choice.

"Having mounted the device, one of the wires is connected to the frame. The proper way to do this is to remove the nut and washer from a convenient bolt on the frame—and the bolt too, if possible—clean off the rust and paint from the frame member around the bolt and brighten it with a file or emery cloth, polish the un-

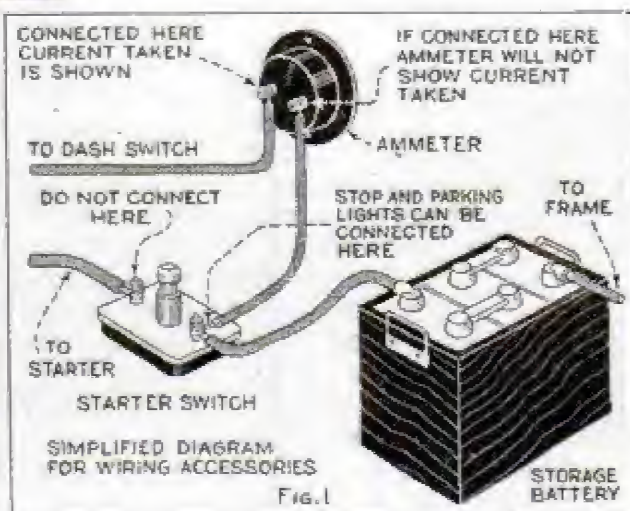
derside of the washer with the emery cloth also, skin the wire and brighten it, loop it around the bolt—so—then place the washer back with the bright side against the wire, replace the nut and tighten it. (See Fig. 2.) This makes a good clean connection, and one that won't give you any trouble for a long time. A light coat of shellac over the joint is an additional precaution against corrosion, but care should be taken not to put on such a coat that the shellac will creep between the wire and the frame or washer and ruin the connection. Now the other wire can be connected, and it will usually be found convenient to connect it to one side of the ammeter. There are two terminals on the ammeter, and if the wire is connected to one terminal, the current consumed by the accessory will register on the instrument; if connected to the other, it won't. Whether it registers or not is largely a matter of choice; I prefer it to register, in the case of a spotlight. If it is a heater that is being attached, like a hand warmer or a carburetor heater, it is better that the current doesn't pass through the ammeter, as it usually is somewhat heavy, and might injure it. Switch on your spotlight. Now we'll try the end of the wire on this terminal. Doesn't show any reading? All right, we'll try it on the other. It shows now, doesn't it? There, she's tight. That's

all there is to it. If it doesn't register when connected to one terminal, try the other. What if you don't know which is the 'on' position of the accessory switch? Oh, that's easy, just wire temporarily direct to the battery terminals and try the switch both ways; that'll soon show which is the right position.

"I remember that the first car I had to put a spotlight on had no ammeter. I was kind o' green at this electrical game at the time, and it stuck me. My boss showed me how to do it, though, and it's just as simple as this job. He first found the 'on' position of the switch, in the way I just mentioned, and turned it on. Then he turned the lighting and ignition switch on the instrument board off, and connected one wire from the spotlight to the frame, just like this. Then he started touching the bared end of the other wire to the terminals on the back of the lighting switch until he found one where the spot would light up, and that was the one he connected it to. If you ever run into a car like that, however, be sure that the accessory switch is turned on, or you'll be likely to hunt a long time for the right terminal.

"A stoplight or parking light may sometimes more conveniently be connected to one side of the starting switch (Fig. 1), but be sure to connect it on the battery side of the switch, where the battery wire is connected to the ammeter. In this case, of course, the current taken by the light is not registered on the ammeter.

"There is another way to connect a spotlight that has some advantages. The spot is usually trained on the right-hand side of the road, and in many cases is not used when the bright lights are on, the driver turn-



Here Is a Simplified Diagram of the Wiring Involved in Connecting Accessories on the Car

ing on the spotlight when he switches from bright to dim on meeting another car. This means two motions. If the spotlight wire is connected to the terminal on the back of the lighting switch that supplies current for the dim lights or for the small side lights, the act of switching from bright to dim will turn on the spot at the same time. On the Ford, this connection may be made at the connection block or manifold at the front of the dash. On the older type, the connection block has five terminals, and the spotlight is connected to the second one from the left—the one carrying the yellow wire—if the light is to be connected to the battery at all times. (See Fig. 3, A.) If you want it on with the dim lights only, connect it to the terminal on the extreme right (B, Fig. 3); this terminal carries a yellow wire—if you can make out the color. On the newer Fords the block has six terminals, and the third from the left, carrying the yellow wires, gives a direct battery connection. The one on the right as before, (but now carrying black wires) connects the light to the dim circuit.

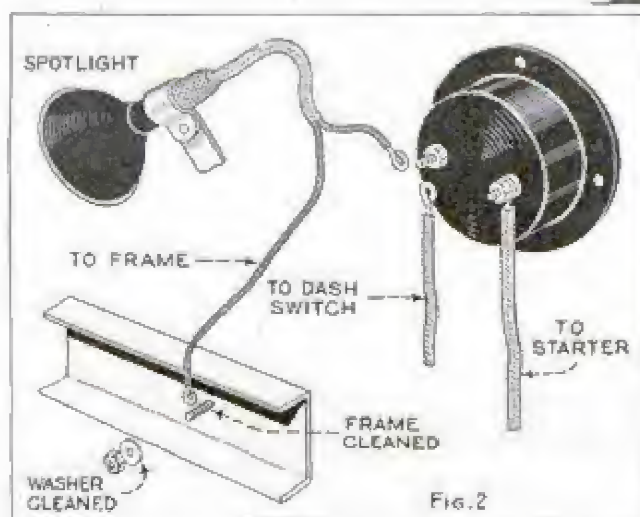
"Suppose you forget which terminal is which? That's easy! In this case, the lighting switch is turned to the 'dim' position, and the end of the wire touched to the terminals on the block, in turn, until one is found that will light the spot. To make sure that it is the right one, switch to 'bright' and see if the spotlight goes out. If it does, it's OK; if not, you'll have to try again, as you may have hit the horn terminal, or some other one.

"Connecting stoplights? Well, there are a number of ways to do this job, but the simplest way for the average owner is to connect one wire, from the stoplight switch, to

one side of the starting switch and the other wire to one of the terminals on the stoplight socket. The other socket terminal is grounded to the frame. If you want to have an indicator that will show whether the stoplight is working or not, and I would advise having this, for a stoplight that isn't working is worse than none at all, then you can install another dash-light socket carrying a 2-cp. bulb, on the instrument board. Run one wire from the ammeter terminal to one on the dash socket, and another wire from the socket to the stoplight switch, then to the light, which is grounded to the frame as usual. This is the simplest way, although by no means the best. You can color the dash bulb red so that it will show up strongly whenever the light is operated.

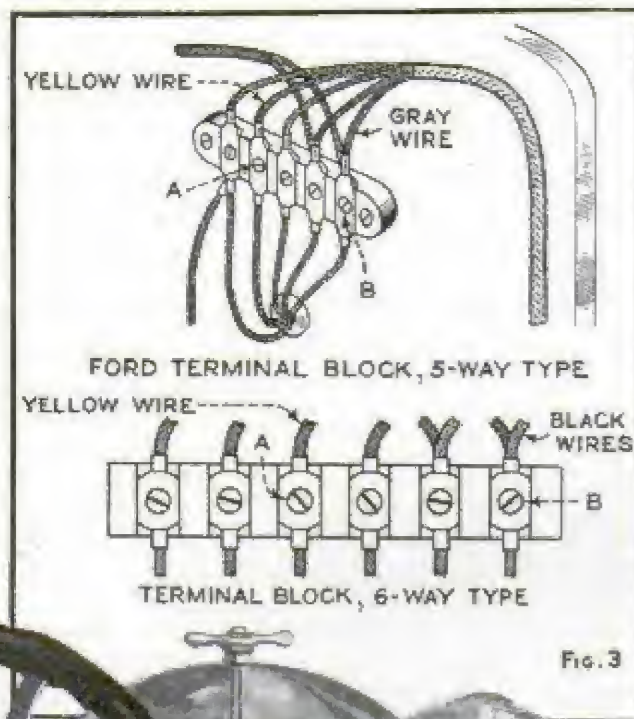
"When you get a stoplight, examine the switch thoroughly and see that it is well made, for the switch is usually the weakest part of the installation, and most of the stoplights that are not working have inoperative switches. Look at the switch occasionally after it is installed and see that it stays in good condition—an ounce of prevention is worth a pound of cure, you know, and this applies to all the electrical accessories. I will tell you more some other time about the other ways to install stoplights.

"Most accessories are connected by



The Ends of All Wires Should Be Bared and Scraped Clean, and All Frame Contacts Polished

means of flexible cords, and these will kink and fray, leading eventually to breaks and short circuits. See that the wires are stapled to the body or fastened to the frame firmly. Wires leading inside the car can be sewed to the upholstery, and this is usually the neatest way to fasten them. Under the car, they can be



tubing over it wherever it touches the frame of the sheet-metal body, so as to prevent rattles that may prove difficult to find some time in the future.

"There you are, Bill, all set. No, no trouble at all, only next time let me sell you the accessory as well as install it for you. Sure! I hadn't any spotlight



Testing on the Ammeter Terminals before Tightening; Above, Connections for the Ford System

stapled to the floorboards. If armored wire is used, slip a short length of rubber

yesterday but I'll have them in this afternoon. So long!"

How to Remedy a Common Clock Trouble

The minute hand of a clock sometimes catches against or under the hour hand, which gradually brings the clock to a standstill. If the hands are released, the clock will run till the hands catch again, but it will strike wrong because the minute hand has dragged the hour hand out of position. An hour hand has a round hole in it and fits on a round section of the spindle; it may be turned forward or backward without injury to the works. But a minute hand has a square hole in it and fits on a square section of the spindle; this hand, therefore, may be moved for-

ward harmlessly, but it is risky to try to force it backward. There is a simple way to remedy this trouble. First turn the minute hand straight up, pointing to twelve. Stop the clock. Pull out the pin that is in the spindle in front of the hands. Remove the minute hand. If it is crooked, bending toward the hour hand, it should be straightened, but before attempting to straighten or to bend a clock hand be sure to heat it. Some clock hands are hard and brittle and will break if one tries to change their shape when cold. It is seldom necessary to alter the hour hand, for hour hands are usually perfectly straight, but if bent, it is best to straighten this hand also, using the same precautions

against breakage. Push the butt of the hour hand in until it is flush with the shoulder on the spindle. Then replace the minute hand, point upward. Next, insert a pin in the hole in the spindle in front of the hands. Such a key should project at least $\frac{1}{8}$ in., at both ends, outside of the spindle. If the pin that has been in use is not long enough, whittle a new one out of a piece of hardwood. Lastly, pack the space between the pin and the minute hand by wrapping the spindle with a string. Continue wrapping until the roll of cord reaches nearly to the ends of the pin. Then tie a hard knot and clip off the ends of the string. Such packing, carefully done, holds the minute hand firmly against the shoulder of the spindle and tilts the point of it outward, away from the hour hand. The erratic striking must then be corrected. To do this, start the pendulum and wait till the clock strikes two or more. Count the strokes. While holding the minute hand at twelve, and stopping the clock, turn the hour hand to the hour that was struck. If the repaired clock is found to be behind correct time, move the minute hand forward slowly, always pausing for the clock to strike, till the hands point right. If the repaired clock is ahead of correct time, do not start it till the governing timepiece catches up. Then put the pendulum to swinging. If there's nothing wrong with the works, regular winding thereafter will keep the clock going and it will strike right.—Dr. H. D. Ribble, Blacksburg, Va.

Homemade Clothes-Line Reel

This clothes-line reel is attached to one corner of the house and is always ready for use. The sides are made of wood, cut to the shape shown in the photo; the top and bottom are pieces of sheet metal, and



Novel Homemade Clothes-Line Reel Is Attached to Corner of the House

a sliding sheet-metal door is provided in front to protect the line against the elements when not in use. The reel is operated by a crank in connection with a pawl and ratchet to keep the line taut.

Binding Pamphlets

Having some pamphlets which I wanted to keep for reference and therefore desired to bind in some inexpensive way, I



Cheap and Satisfactory Method of Binding Pamphlets and Magazines

devised the method shown in the photo, and found it entirely satisfactory.

Two holes were punched through the pamphlets and through two pieces of red "leatherboard," which were used as covers, so that all of the holes registered. For each binder two pieces of $\frac{1}{16}$ -in. piano wire, 1 in. shorter than the pamphlets, and two steel coil springs of $\frac{1}{8}$ -in. diameter, about 1 in. long and looped at both ends, were obtained. The springs were slipped through the holes in the assembled covers and pamphlets and the wire rods threaded through the spring loops at top and bottom. When the thickness of the pile exceeded the length of the springs, a hook was used to pull them up, after which the rod was again slipped through the top loop. In this way the pamphlets were held together tightly and could be handled like a book.—Leslie H. Phinney, Springfield, Mass.

Opening Tin Cans

If the point of the opener is inserted just below the beading of the can top, with its heel at the left of the vertical seam,



Cutting Tin Cans through the Side Is Easy and Permits All the Food to Be Removed

it can be run around the can with much less effort than is required in cutting through the top. Besides, by using this method, the extra force needed to make the flat blade follow a curved path is eliminated. Opened in this way, the can is emptied readily and completely, while a top-opened can usually leaves a jagged edge that retains some of the food and is much more likely to cause injuries than the comparatively clean edge produced by side cutting.—Chester Lynndelle, Trenton, N. J.

Removing Play in Ford Fan

The new style Ford fans often develop end play due to excessive wear. As the front end of such fans is closed, the fan would have to be taken off and the blades removed from the pulley before the shaft could be turned in to remedy the play in the usual way. A better method of taking up this play is to remove the cotter pin from the locknut at the rear end of the fan shaft and loosen the lock about one full turn. Then place a cotter pin through the nut and the fan shaft, but do not spread the ends. Next, turn the locknut with a wrench and the fan shaft will turn with

it. Turn the shaft in until only a very slight end play can be felt. Then remove the cotter pin through the locknut and tighten it. Replace the cotter pin through the locknut and spread the ends. The locknut on such fans must be kept tight and the cotter pin in place, or the fan will eventually turn the shaft in so tightly that the fan will stop.—E. T. Gunderson, Humboldt, Iowa.

Nickelplating Brass

Some time ago I had some brass boat parts which I desired to nickelplate. A friend of mine told me how it could be done without using an electric current. The following is his method: Dissolve 8 oz. of sal ammoniac and 8 oz. of double nickel salts in 1 gal. of water, then heat the solution nearly to the boiling point. Now put in your brass or copper articles together with some scrap aluminum, taking care that the aluminum touches the articles to be nickeled. In a short time a nickel deposit will be found on the brass. Although this deposit is not as heavy as that obtained by electroplating, it may be lightly buffed and will be satisfactory in many cases.—Ralph Hanenkratt, Albany, N. Y.

Counterweight on Cellar Door Aids in Operating

Cellar doors of the type shown in the photo are more or less difficult to handle



and there is always danger of their falling down, which may cause a serious accident when one is ascending or descending the steps. A counterweight eliminates this risk entirely. Simply attach a pulley to the side of the house and run a length of sash cord over it, fastening one end

of the cord to the cellar door and the other to a suitable counterweight. A 2-in. pipe filled with concrete will serve nicely for this purpose.

Ammonium chloride
nickel sulfate

Writing Cabinet for the Library Table

By GEO. H. CAPPEL

AN attractive and roomy writing cabinet, which is set on the library table and will easily hold all writing materials, paste, etc., can be made by anyone handy with tools and careful to follow instructions. Ordinary wallboard may be used for the back, front or writing door, and for the end panels, while cypress is used for the top, base and edges.

The cabinet is $19\frac{1}{2}$ in. long, $12\frac{1}{2}$ in. wide at the base and 9 in. at the top, and is $10\frac{3}{4}$ in. high. This is about the most convenient size for the ordinary library table. The sides, back and front are made first. The wood is glued to the wallboard and then tacked on the inside so that no nails will be exposed. The base is then put on. The curved lines are first penciled off carefully and then cut out with a scrollsaw. The bottom, which also may be of wallboard, is next put in place; it is held by wooden cleats,

can be obtained at any hardware store. If desired, a lock may be used. The inside is partitioned off to suit the user. Thin stock is used for this purpose. Pieces of felt or rubber-head tacks are used on the bottom of the cabinet and on the door, where it rests on the table when open.

All the woodwork is stained with asphalt thinned with gasoline, rubbed off with a cloth, followed up with two applications of shellac, applying the second coat after the first has dried thoroughly. It is finished with wax, which will give a neat appearance. The panels or exposed parts of the wallboard are papered with wall paper, to match that of the

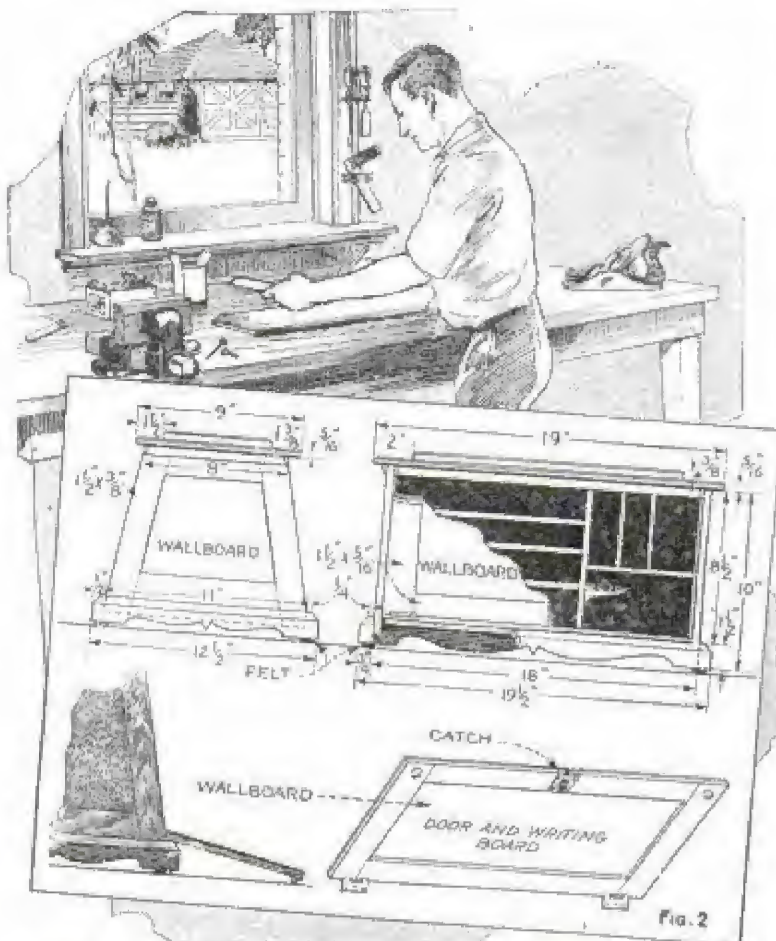


Paneled Writing Cabinet Is Designed to Stand on the Library Table and Has Plenty of Space for All the Writing Materials

nailed inside of the sides, back and front. The top is a nicely grained piece of cypress, nailed to the back and end with headless nails, which are sunk with a nail set and the holes filled with putty or wood filler. The door is then fitted in place; it is hinged to the base with two or three small nickel hinges and a catch, which

room. This will make quite a novel and unusual type of writing cabinet.

The method of staining previously mentioned gives a golden-oak finish, of a depth depending on how much the asphaltum is thinned. For a fumed or mission-oak finish, use wood dye or a similar penetrating stain, smoothing the rough surface, after staining, with fine sandpaper and finishing with wax as before. Varying shades of oak, walnut and mahogany can be obtained in the wood dyes, so that the cabinet can be finished to suit the furniture in the room.



Anyone Handy with Tools Can Build This Writing Cabinet. It Is Made of Cypress and Wallboard

Where prepared dyes and stains cannot easily be obtained, the amateur can make his own. Mahogany stain may be made by dissolving Bismarck brown in alcohol. Mission-oak finish may be obtained by exposing the wood for a day or two to the fumes of strong ammonia (28 per cent) in a tightly closed box. If the wood is moistened with water just before exposure, the resulting stain will be darker than if fumed dry. The surface must be sandpapered after fuming and before waxing or oiling.

If a varnished finish is desired, the surface should be filled, using a good paste filler, applied, after staining, in the manner specified by the maker. The filler must be well rubbed off, when dry, with fine shavings or cotton waste, rubbing across the grain. After sandpapering, the wood is ready for the varnish.

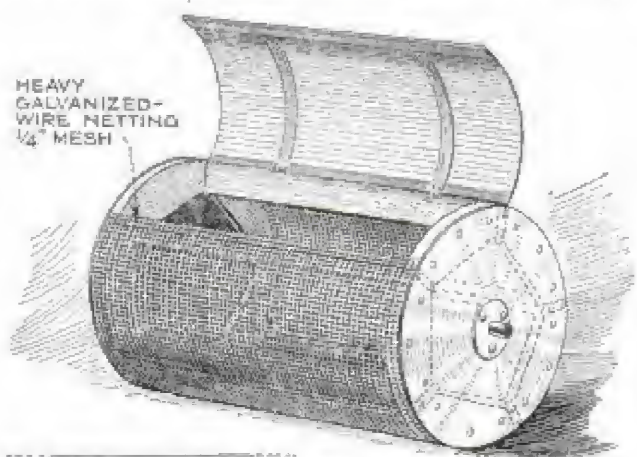
Improving Roofing Paint

Tar or asphalt roofing paint makes a lasting and very cheap covering for a tin roof even though it is badly pitted with rust. A great objection to many of these preparations, however, is the fact that they are black and absorb so much heat as to make the house perceptibly warmer.

In recent tests of black and white paints as applied to oil tanks, it was found that the latter rose in temperature only 19 to 22° and lost only 9 per cent of their naphtha content as compared to a temperature increase of 54° in tanks covered with black paint. Obviously similar conditions hold true where the roof of a house is coated white or black. A cheap and effective method of overcoming the objection to the use of asphalt paint is to dust its surface with beach sand or finely powdered stone of some light color. The paint will soften when the sun shines on it so that the stone or sand will stick.

Rebuilding Washing-Machine Cylinder

The revolving cylinder in our electric washing machine began to wear out. The perforated metal covering around the cylinder was breaking from hole to hole, which let the clothes work through and tear. However, the two ends, the wooden crosspieces and the lid were still in good condition, as was the rest of the machine. A new cylinder would cost \$28, so I decided to rebuild the old one myself. After carefully removing the worn-out coverings from the ends where they were rimmed together, I sawed ten pieces of 1 by 3-in. cypress to the shape shown in the detail. These pieces were placed from one crosspiece to another entirely around the ends as shown by the dotted lines, and were fastened to the metal ends with cop-



Galvanized Wire Mesh Used to Repair a Washing-Machine Cylinder

per screws. This braced the crosspieces and also served as a base to fasten the edges of $\frac{1}{4}$ -in. galvanized-iron mesh. I used the 24-in. width and as the cylinder was 22 in. long, this permitted overlapping the mesh about an inch to fit inside of the edge of the cylinder. Starting at the crosspieces where the lid is hinged, I fastened the mesh by using $\frac{3}{16}$ -in. round-head bolts, $3\frac{3}{4}$ in. long, placing the heads inside of the cylinder so that they would be drawn slightly into the wood when tightened up and would leave no sharp edges to tear the clothes. I lapped the ends of the mesh about an inch to get a better hold. A strip of sheet brass was placed between the wood and the mesh. The bolts were then tightened after placing a washer under the nut. The sheet brass was turned over the nuts, after cutting off the ends of the bolts, and screwed down to cover the rough edge of the mesh. The mesh was then drawn around the cylinder, putting in a few temporary screws to hold it in place. It was fastened to the other side of the lid opening on the crosspiece in the same way as before. Putting this netting on was a rather tedious task but it has proved entirely satisfactory.—S. E. Schofield, Indianapolis, Ind.

Burnt Match Receiver

During fire-prevention week, the children in our schools were required to contrive some novelty that would aid the purpose. Our eight-year-old lad noticed how a dangerous fire had once started in our kitchen by dropping a still blazing match into a receptacle near the stove. So he decided to prevent a recurrence. Taking an empty tin can, he pierced the bottom with a large nail, pressed the oval lid in place at the top and then placed the can in an inverted position near the stove. The burnt matches are dropped into the container through the holes, and when full, the can is emptied. The matches seldom continue to burn after they are dropped into the can and if they do, the flame soon goes out.—Rev. Lewis F. Freyberg, Zanesville, Ohio.



Driving Small Wood Lathe by Foot

The treadle attachment on a wood lathe shown in the illustration has been used successfully for two years. The attachment consists of



Running a Small Wood Lathe with a Treadle Attachment

gine block with the crankshaft, two connecting rods and a Chevrolet flywheel. The flywheel was turned down and holes drilled in it so that it would fit on the end of the crankshaft, and the face crowned to keep the belt on. An idler pulley is fastened to the bench top to permit adjustment of the belt. Two connecting rods are used to support the idler pulley and these are fastened to a block of 1-in. wood, which has slots cut in it and is held to the bench top with screws and wingnuts. The pedals are hinged to a crosspiece under the bench and are connected to the crankshaft.—J. P. Kincaid, Durant, Okla.

Starting Furnace Fire with Gas

For starting a furnace fire quickly, one man bent a 2-ft. length of $\frac{1}{4}$ -in. gas pipe to a 45° angle and attached to it a length of rubber hose, which he connected to the nearest gas fixture. When the furnace fire is desired no kindling is used, but this improvised gas burner is held under the grate and in a few minutes the coals will glow. This method is perfectly safe and eliminates chopping of kindling, which is more or less difficult to get in large cities.—Mrs. V. S. Martin, Detroit, Michigan.

Lighting the Fish Bowl

An illuminated fish bowl, which is attractive in the den or parlor, can easily be constructed in the home workshop. The



Electrically Illuminated Fish Bowl Adds to the Appearance of the Parlor

stand shown is 12 in. square by 4 in. high, but the size will, of course, have to be varied according to the size of the bowl, which in this case is a cylindrical jar. If a wood-turning lathe is available, the stand may be turned round, although a square stand is the easiest to make. A square of cardboard with a circle cut out equal to the diameter of the bottom of the bowl is inserted under the ground glass, to prevent the light from escaping around the sides of the bowl. Illumination is provided by a 6-volt lamp which can be run on a bell circuit obtained by the use of a bell-ringing transformer. The stand may be stained or varnished to harmonize with the furniture, and be made as elaborate as desired. Two small holes should be drilled in the rear to permit heated air to escape.—R. B. Clifton, Denver, Colo.

Avoiding Battery Trouble

Regular use of a good hydrometer is the only way to know whether or not a storage battery is getting a proper charge. The heaviness of the acid is the only true indicator of the condition of the battery and the hydrometer measures this. Never leave a battery in a discharged condition and, whether in use or not, don't leave it without attention for a long period of time. When not in use, a fully charged battery will become one-third discharged in a month or so. Neither should a battery be overcharged. The gassing produced if this is done disintegrates the active material in the plates. Keep the battery well charged in winter. This may necessitate increasing the charging rate over the summer normal. A fully charged battery cannot freeze. Keep the hold-down bolts tight, or the box will be damaged and the terminals are likely to be loosened, due to shaking of the battery which allows acid to creep up around them. Also, sediment will settle between the plates and cause an internal short circuit. Never add anything but distilled water to the electrolyte; boiled water won't do. And never fill the battery with "trick" solutions.—A. C. Cole, Chicago, Ill.

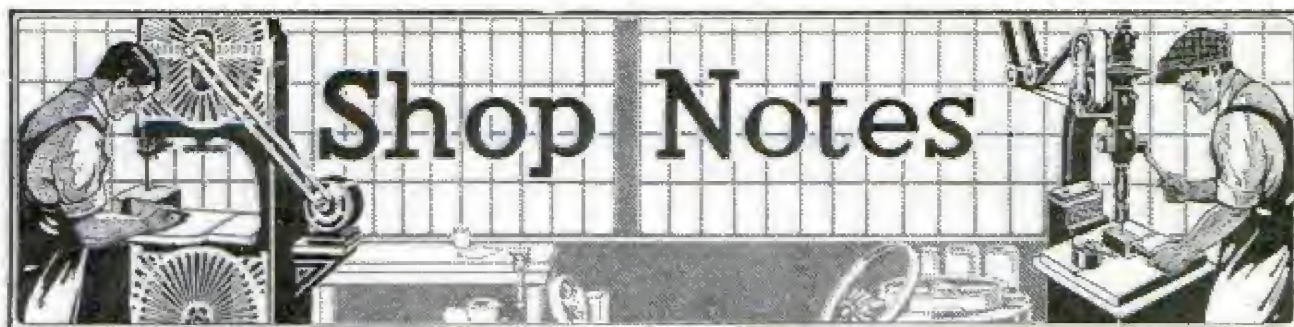
Sidewalks of Colored Squares

Quite a novel departure in the construction of cement sidewalks is shown in the photo. The pavement is made up of large colored squares. The colors are mixed in the cement in separate batches, which should be worked up carefully. Wooden frames of 2 by 4-in. lumber are used as forms, and tar paper is placed between adjacent squares to keep the colors from running together. It is not necessary to use colored cement for the entire thick-



Large Squares of Different-Colored Cement Make an Unusually Attractive Sidewalk

ness of each block; the base can be made of ordinary concrete and a $\frac{3}{4}$ -in. thickness of cement applied on top. Ground colors for cement work can be purchased at any paint store.—M. A. Ayers, San Francisco, Calif.



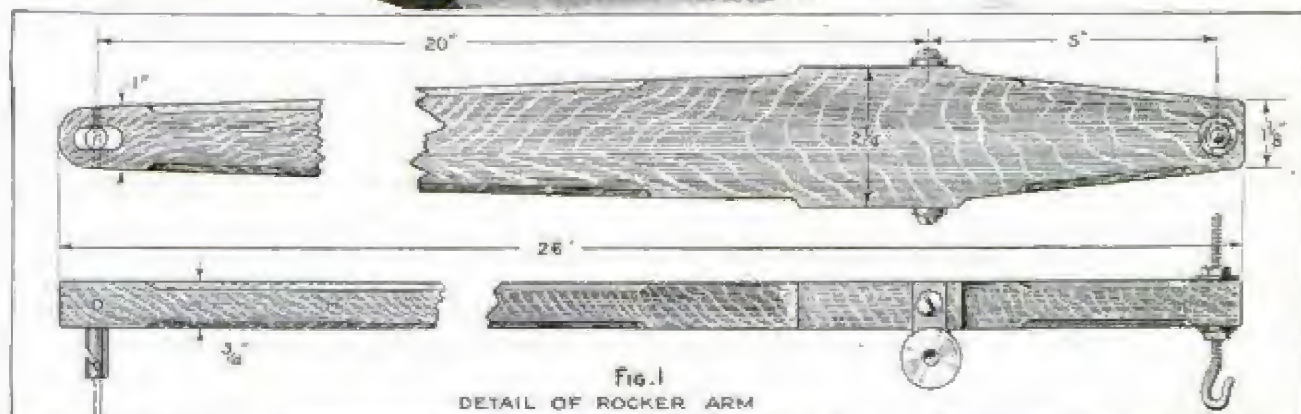
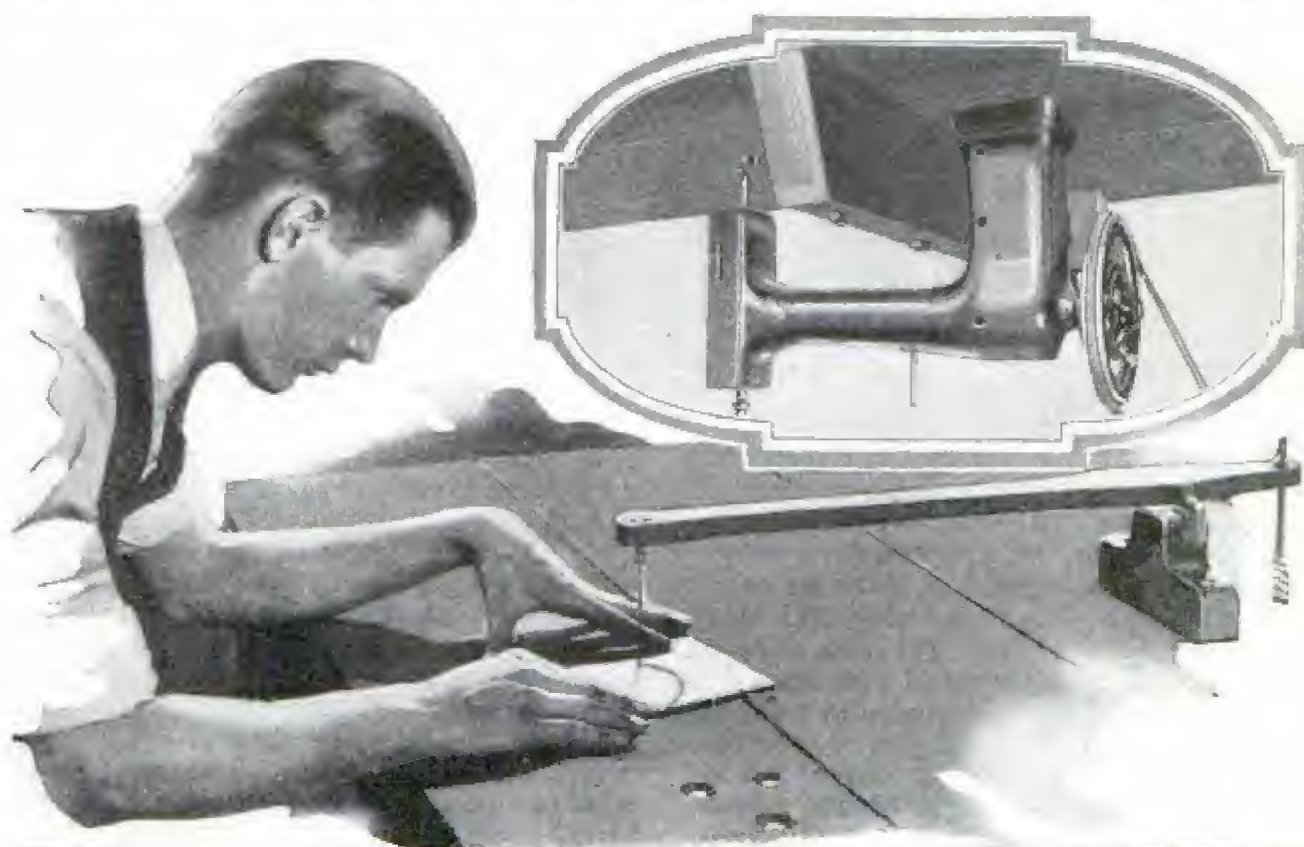
All Shop Notes published in 1925, in book form—Fifty Cents—from our Book Department

A Jigsaw for a Dollar

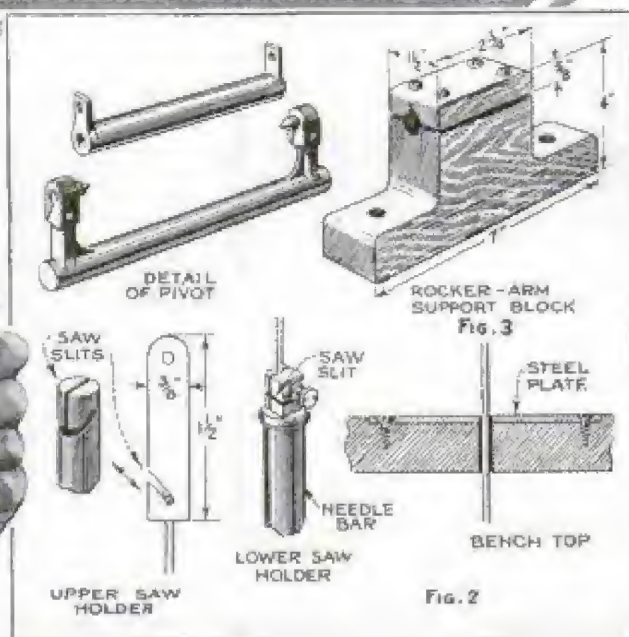
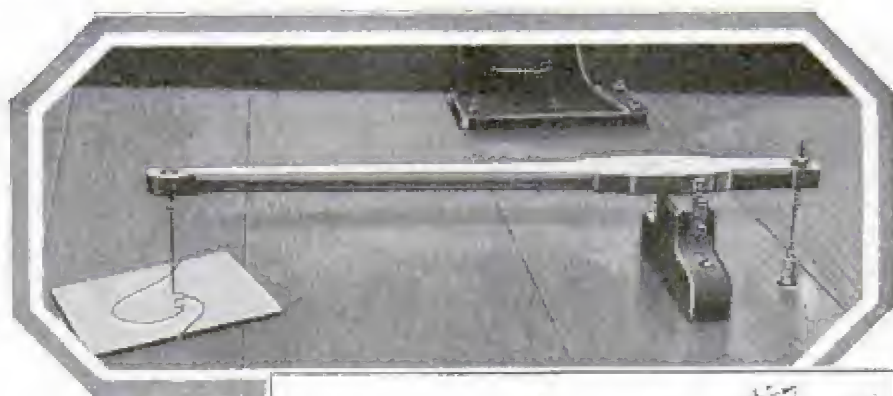
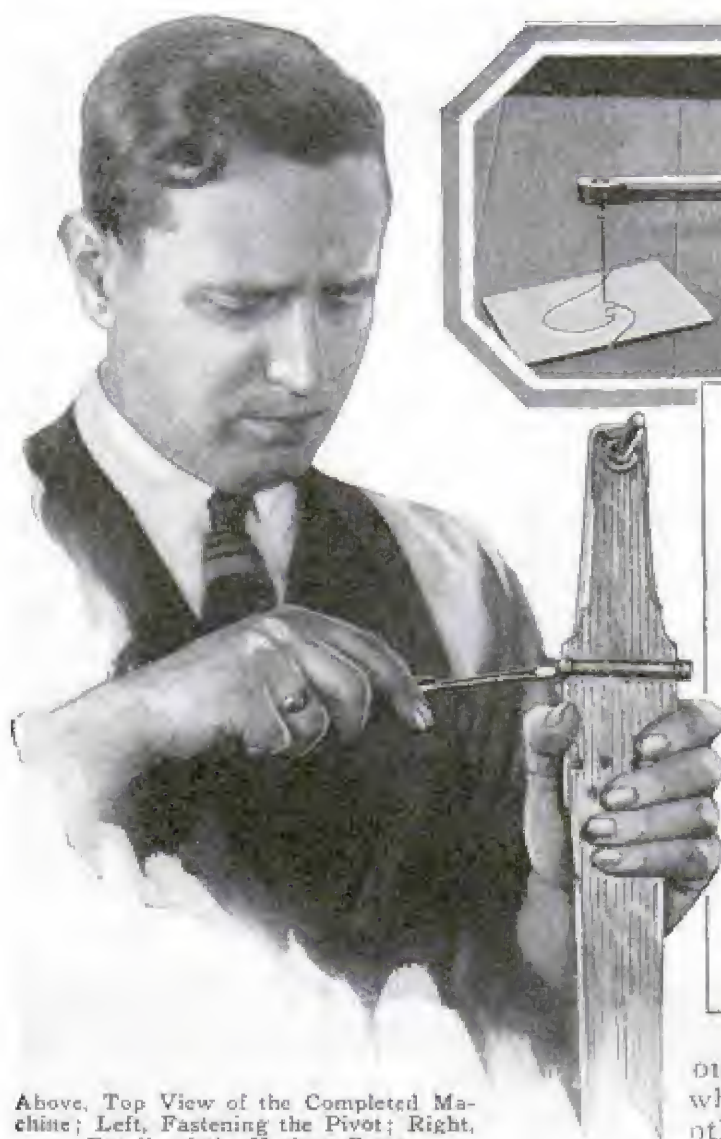
By M. ORDAHL

WANTING a jigsaw for his shop, but not having the wherewithal at the moment to buy one, a mechanic set out to improvise one. After thinking the matter of a suitable mechanism over for some time, he decided that the easiest

thing from which to make it was an old sewing machine. Half an hour's search of the secondhand stores in the neighborhood resulted in his parting with a dollar and acquiring an old head, the insides of which were all present and in good order.



A Jigsaw Made from an Old Sewing-Machine Head; Insert, the Head in Position under the Bench; Below, the Rocker Arm



Above, Top View of the Completed Machine; Left, Fastening the Pivot; Right, Details of the Various Parts.

The first thing done was to remove all the mechanism that was not directly involved in giving the reciprocating movement to the needle bar, and this was easily done, the parts removed being laid aside for the moment. The cast-iron base of the head was then removed and the head turned upside down and placed in position under the bench where it was to be used. Holes were drilled in the bench top to correspond to the position of the screws that formerly held the base, the old holes in the head tapped out to fit $\frac{1}{4}$ -in. capscrews, and the head fastened in place. The heads of the capscrews were counterbored into the bench top so as not to interfere with the work, and a small hole was drilled in the top of the bench in line with the end of the needle bar.

As the saw was to be driven from a small motor mounted on the base of the bench, the flywheel was removed from the sewing machine and grooved for a $\frac{1}{4}$ -in. round belt. There was plenty of stock for this. Incidentally, the wheel had a small clutch that was used when winding bobbins, and this worked in very nicely, as, by throwing

out the clutch, the jigsaw would "free-wheel" while the motor was in use for other purposes.

A rocker arm was next made to the dimensions given in Fig. 1. This was made of oak, and was provided at one end with a hook for the spring, made from a $\frac{1}{4}$ -in. bolt. The other end of the arm was slotted and fitted with a saw holder. This was made from a short piece of $\frac{3}{8}$ -in. cold-rolled steel, slit with the hacksaw to admit the end of the jigsaw blade and to catch the blade pins. (see Fig. 2). The saw holder swings on a brass pin, driven through the sides of the arm. Upon looking over the parts taken from the underside of the sewing-machine head, a pivot and pivoted shaft were found, which, with a few minutes' work, were adapted to form a pivot for the rocker arm. One of the parts had two lugs that were cut off to length, drilled for small wood screws and fastened to the rocker arm. The other part had two adjusting-screw centers and was fitted into a support block, made as shown in Fig. 3. This, in turn, was bolted to the top of the bench and the arm slipped into place and adjusted by means of the pivot screws. Directly below the hook on the rear end of the arm, a hole was bored in the bench, and a spring (taken from an old bed

spring) hooked on, passed through the hole and held in place by means of a short piece of $\frac{1}{4}$ -in. rod through the end.

It was only found necessary to cut a cross slit in the end of the needle bar in the head to adapt it to holding the saws. The top of the bench was recessed to take a sheet-steel plate, through which the saw passed, and the saw was complete.

The motor driving the saw has a speed of 1,750 r. p. m. The grooved wheel on the saw is approximately $5\frac{1}{2}$ in. in diameter, and a 3-in. pulley on the motor will run the saw at a satisfactory speed.

Washing Auto Windows

For washing automobile windows that have become covered with oil, dirt or dust, the following formula will be found excellent: 1 gal. water, $\frac{1}{2}$ cup alcohol, $\frac{1}{2}$ cup ammonia, and 1 tablespoon salt. The water, of course, serves its usual function as a cleanser, the alcohol aids in drying and saves a lot of rubbing, and the ammonia and salt cut the grease and fix the luster on the glass. This is splendid for general window washing also, and to give a high luster to fine cut glass.

Improving the Crowbar

Crowbars of the usual type can be greatly improved by providing a handle at one end, as shown in the photo. This prevents blistering of the hands and the bar can be manipulated more conveniently. To make this handle, one end of the bar is split with a hacksaw and the halves rounded to form the sides and handle. A short piece of pipe is slipped over the ends just before they are bent together.



A $5\frac{1}{2}$ -ft. bar has been found most convenient for farm work, and for chopping through ice, frozen ground, etc.

Building Tapering Brick Pilasters

Building tapering brick pilasters seemed a difficult job, but proved quite easy with the aid of the guides shown in the photo. Two lengths of 1 by 3-in. stock were



Guide for Erecting Tapering Brick Pilasters Saves Time

cut to the required height. These were braced by smaller crosspieces, and wires were used to hold the sides together. The pilasters were then built up inside. This method proved timesaving and enabled the builder to make all the pilasters alike. —E. J. Veronda, South Pasadena, Calif.

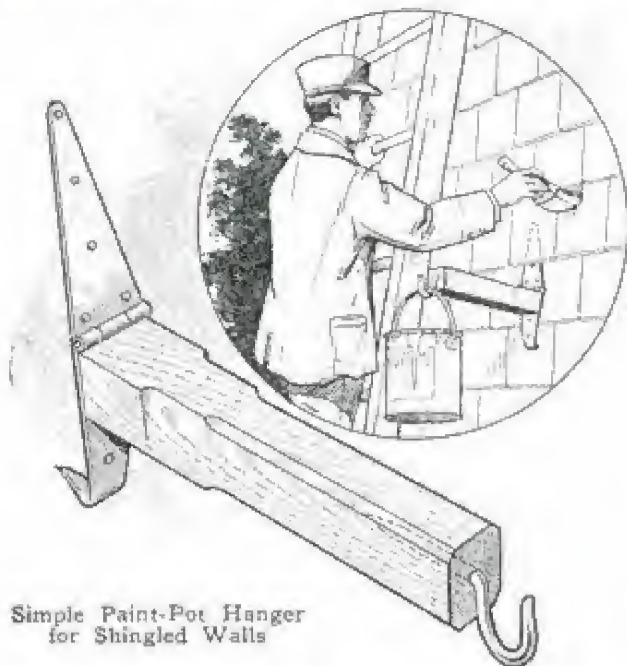
Relief for "Burning" Feet

Workmen in machine shops and garages will find relief from "burning" or "scalding" feet, if they cut an inner sole for their shoes from ordinary cork gasket or packing material. After cutting the cork to fit, it is securely fastened in the shoes by shellacking the bottom side of the cork and applying a light coat along the middle of the sole. If the size of the shoe permits, make these inner soles of two thicknesses of cork.

When making ring gauges, always leave a thin collar on each end of the hole, so that any bell-mouthing in lapping can be ground off.

Paint-Pot Hanger

Nearly all paint-pot hangers are arranged for use on a ladder, or to attach to some place on the wall which is suited



Simple Paint-Pot Hanger
for Shingled Walls

for the purpose. The one shown in the illustration is designed for use when painting a shingled house. It consists of a piece of hardwood, 6 or 8 in. long, with a hook in one end, from which the pot is suspended, and a long strap hinge screwed to the other, as shown. The upper end of the hinge is left in normal condition, but the lower end should be filed down to a sharp point and bent away from the stick at right angles. The method of using this hanger is evident from the illustration. The weight of the paint pot will force the pointed end of the hinge into the wood.—L. B. Robbins, Harwich, Massachusetts.

Emergency Water Supply for Washroom

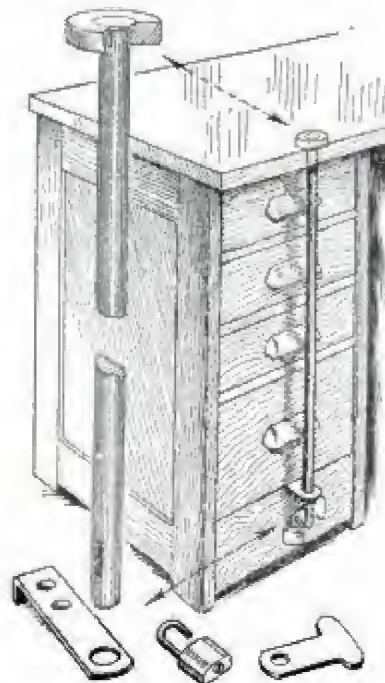
A break in the water pipe supplying the men's washroom made some repair necessary as it was near quitting time and scores of men would demand water for cleaning up. As the break could not be fixed at once, the pipe was uncoupled and plugged on the washroom side of the break with a hardwood plug and a garden hose attached to one of the faucets in the washroom and run to a sprinkling hydrant outside. Then, by opening this particular faucet and turning on the hydrant, water was forced backward into the faucet under high pressure and a fair pressure was obtained at each faucet in the washroom.—Harold E. Benson, Boulder, Colorado.

Removing Rust from Tools

Many of the so-called rust removers actually remove the rust from objects but also the finished surface of the metal itself. A derusting process has just been evolved in which acids and alkalies are eliminated, a simple chemical substance being used in a water solution. The substance is ammonium citrate. A tablespoonful of this to $\frac{1}{2}$ pt. of water works very well. The chemical is inexpensive, non-corrosive and gives off no fumes; in fact, it is a very agreeable substance to work with. The tools, instruments, etc., are immersed in the solution overnight. In the morning, the rust will be found to have disappeared, the solution being brown, due to the formation of ferric citrate. But the solution can be used until depleted. The articles are then rinsed in water and oiled. If desired, they can be left overnight in a solution of potassium chromate, then rinsed and dried.

Locking Cabinet Drawers

Cabinet drawers without locks can be made safe by using the method shown in the illustration. The locking device consists of a $\frac{3}{8}$ -in. iron rod,



long enough to pass in front of the drawers, with a collar 1 in. in diameter pressed onto the top end. A $\frac{9}{16}$ -in. hole is bored through the top of the cabinet and counter-bored about $\frac{1}{4}$ in. deep so that the collar will be flush with the top when the rod is passed through. The

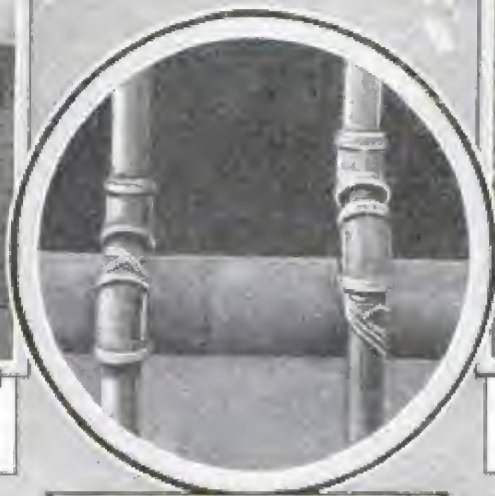
lower end of the rod is slotted to take a sheet-metal latch drilled for insertion of a lock, and is held in a perforated strap countersunk into and screwed to the base, as indicated.—R. L. Hill, Saginaw, Mich.

☛ Transparent celluloid, dissolved in acetone, makes a good lacquer for silver.

KINKS FOR THE BUILDER



Easily Made Desk for Foreman on Job



Pipes Wired in This Way Don't Vibrate



Taping Speaking-Tube Joints Prevents Leakage



Portable Street Barricades

Pipe Drains Porch Floor



A Derrick Swung from the Steel Column of a Building under Construction Is Handy for Many Jobs



Simple Wood Vise Attached to Strut for Filing Circular Saws

A Self-Inking Stamp That Can Be Changed Instantly

One day when I had about 50 envelopes that I wished to print with a return ad-



Self-Inking Stamp Made from a Mimeograph-Paper Stencil and an Ordinary Pad

dress, I found a stencil was in place on my mimeograph. Not wanting to remove it for so short a run, I devised the stamp shown in the illustration. It is self-inking, and the lettering can be changed at any time at a cost of about one cent for each new wording. Although I made the stamp to supplement my mimeograph in marking small articles, such as envelopes, bills, receipts, cards, etc., its use is not limited to owners of mimeographs. It will be found most serviceable to all who have numerous small items to be stamped or printed, but do not care to have a great number of rubber stamps made. Stencil sheets may be purchased for 14 cents and less, depending on size. The 14-cent sheet will make ten to fifteen pieces the size of a stamp pad. The typewriting or drawing is done on the stencil before separating it from the backing sheet. Then the backing sheet is torn off, and the stencil cut to the proper size to fit the pad. Sufficient margin is allowed to fold the sheet over the pad; the sheet is stretched tightly over the latter and the ends glued to the bottom. Pads may be bought in the 5 and 10-cent stores. Impressions are made by pressing the paper on the pad firmly. For some purposes, it is expedient to solder a handle to the back of the pad holder, as shown in the drawing,

permitting the device to be used as an ordinary stamp. When very large pads are used, the impression should be made with a small roller.—Lucius Winchester, Norwalk, Conn.

Repairing Broken Triangles

Triangles are easily broken and the draftsman's habits in handling them do not help the situation materially. Fanning ink lines and other practices soon ruin them. Also, in leaning on them, they are sometimes cracked, making it difficult to pick them up when in a flat position. Cracked triangles can be repaired in a very simple and effective manner. Make a solution of 3 parts of alcohol and 4 parts of ether, mixed together well, and apply it to the broken edges, and when more or less warm, press them together, keeping the triangle on a flat surface and using thumbtacks as bracing. Allow the joint to dry for 24 to 36 hours. The triangle will then be as good as new.—L. H. Georger, Buffalo, N. Y.

Telephone Poles Made from Old Water Pipes



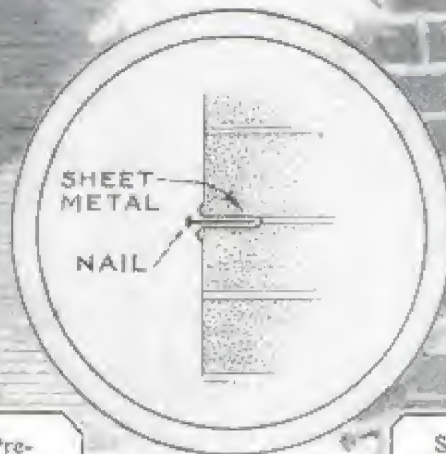
The owner of a telephone system found that old, discarded water pipes make good strong telephone poles, which are of special advantage as frequent fires, kindled along the road to clear the brush, will not harm them. The sections of pipe are 25 ft. long and have a piece of round timber driven into the upper end and to

this piece the crossarms are bolted. It is necessary to paint these pipes occasionally to prevent deterioration due to rust and if this is done, they will last practically indefinitely.—L. M. Jordan, Vredenburgh, Alabama.

KINKS FOR THE BUILDER



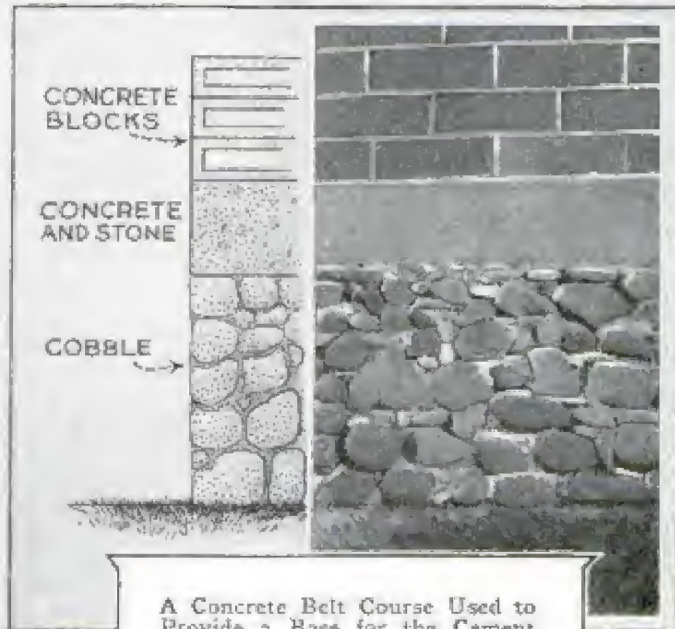
Wire Lath at Joint Prevents Cracks in Finished Plaster



Sheet-Metal Bracket Holds Nails in a Brick Wall



Nails Set in Concrete Floor to Anchor Bumping Post



A Concrete Belt Course Used to Provide a Base for the Cement Blocks



Joist Bedded in Concrete to Make It Firm on Cement Blocks



Beveled Sill of Basement Window Admits More Light and Makes Neat Job; Finished with Cement

Trolley-Operated Concrete Mixer

A novel concrete mixer is being used in San Francisco for paving the street-car tracks. The machine is equipped with



Novel Concrete Mixer That Runs on Street-Car Tracks and Uses Trolley Current

flanged wheels, a trolley pole and a motor, which also runs the mixing drum. A swinging spout, about 10 ft. in length, is suspended ahead of the mixer. The outfit is run on one of the tracks while pouring the paving base for the other. As it is used only at night, the mixer is run off the tracks and parked during the day.

Oiling Spring-Perch Nuts

Late-model Ford cars are fitted with conical nuts on the front-spring perches, which keep the front ends of the radius rod to the axle. When tightening these nuts, they often stop between openings for cotter pins and it is difficult to draw them to the next one. As it is hardly practical to grind off the conical end of the nuts to allow them to be turned on farther, they should be backed off several turns and oil applied to the ends. The oil reduces the friction and usually allows the nut to be turned to the next opening for the cotter pin without trouble.—E. T. Gunderson, Humboldt, Iowa.

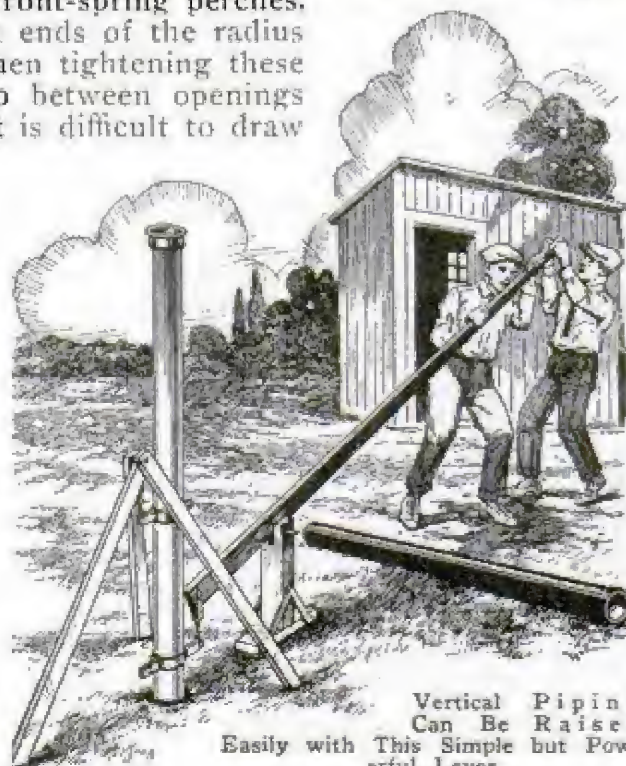
Marking Trunks

Hunting for a particular trunk among a whole carload of them, or in a baggage room, means a loss of time when one is in a hurry. To avoid this, paint a wide stripe of any bright color all around the trunk on the sides and also across the top and bottom. This makes it visible at all times, no matter in what position the trunk is placed, and it can be picked out of a lot of similar-looking trunks at a glance. The stripe should be painted neatly and be from 3 to 5 in. wide.—H. R. Wallin, Galveston, Tex.

Raising Vertical Piping

For raising heavy vertical pipe, such as pump piping, columns to high water tanks, etc., the device shown in the illustration has been found very effective. It consists of a tripod of 3 by 4-in. wood with a 1-in. bolt through the top from which a short chain is hung. Attached to the end of this chain is a clamp made of two pieces of $\frac{1}{2}$ by $1\frac{1}{2}$ -in. strap iron, bent to the shape indicated and held in place by two bolts, to one of which the chain is attached. A lever fulcrumed on a stand, as shown, has a similar chain and clamp attached to its short end. In use, the clamps are fastened around the piping with a sliding fit, so that, when the long lever arm is pressed down, the lower

clamp locks the piping and raises it several inches, while the upper clamp grips and holds it when the lever is raised for a new purchase. Pipe may be lowered with the same device by raising the clamps with the hands as the strokes are made and riding the lever upward. The device is also an efficient post puller.—L. M. Jordan, Vredenburgh, Ala.



Vertical Piping Can Be Raised Easily with This Simple but Powerful Lever

Before painting window sash, rub a cloth soaked in kerosene over the glass.

KINKS FOR THE BUILDER



Building Plaster
Apron for Bathtub



Setting China Soap Dishes;
Copper Nails Hold Mortar



Wood Jack for Holding
Doors While Planing Edges



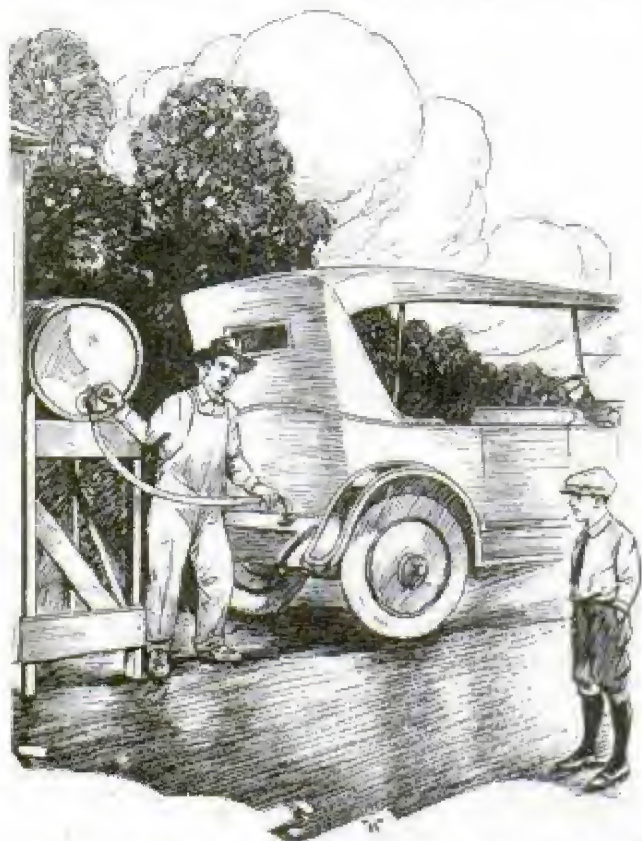
Handy Package Receivers
Built in Front-Porch Wall



Left, a Telephone Niche, and Right,
the Method of Framing It

Convenient Gasoline Drum

A farmer who believes in having everything convenient, built a substantial platform just outside of his garage for a 50-



Elevated Gasoline Tank near Garage Facilitates Filling of Auto Tank

gal. gasoline drum and attached a 5-ft. length of hose to the faucet. The free end is fitted with a small tin cylinder in which is set a strainer of cloth, screen and chamois, to keep out foreign matter.

Operating Small Machinery with Speedometer Parts

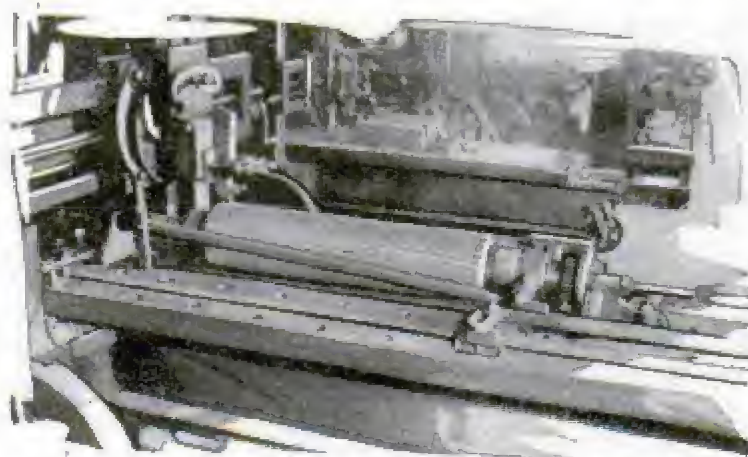
When operating small machinery such as laboratory equipment or moving window displays, it is sometimes desired to have the source of power at a distance, to provide a speed reduction or to transmit power at an angle. Where the power under consideration is small, an old speedometer swivel joint and flex-

ible shaft, which can be purchased for a small sum at an auto-wrecking house, will often solve the problem. The gear reduction in these swivel joints is $2\frac{1}{2}$ to 1, and they need no attention as they are grease-packed. The spur-gear wheel is made of fiber and is easily converted into a grooved pulley. The flexible shaft is perfectly satisfactory for transmitting small power, and can be bent in any direction and located where it is impossible to place motors or belts. Another inexpensive ready-made gear reduction is to be found in the small emery grinding wheels which clamp to a bench or table and are crank-operated. They are generally accurately made and can be converted into a speed-changing device with little trouble.

Cutting Spirals

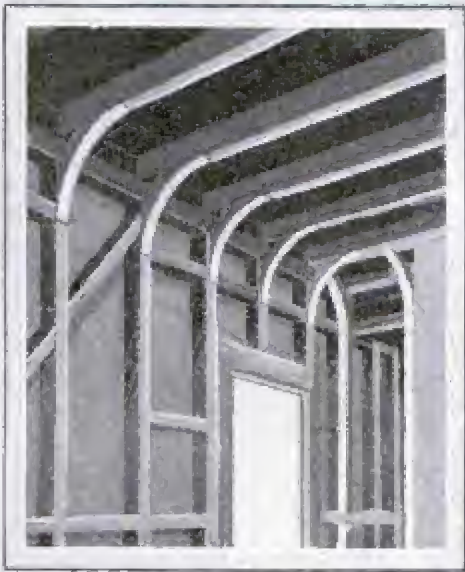
Cutting a spiral or, more correctly, a helix, usually calls for expensive machinery. To do such a job accurately without this equipment is practically impossible, but if the spirals need not be absolutely accurate they can be cut by simpler methods. In the photo is shown a method of cutting a spirally grooved roller in a shop where the only machine that could handle such a large piece was a planer. The roller was mounted on centers and was free to turn about them, subject to the control of a spiraling arm, which was setscrewed into the roller shaft and carried on its end a small roller that traveled up and down on a stationary bar as the whole rig, except the bar, was reciprocated by the motion of the planer bed. A spring set in the far side of the swivel arm kept the roller tight against the bar all the time. After each cut was made, the setscrew was loosened and the roller turned an amount equal to the spacing between the spiral teeth, and then the arm was tightened for another cut. The cutting was done by a

tool ground to shape and fed directly downward into the roll. Spirals made in this way answer nicely on such pieces as feed rollers on wood working machines, leather feed rolls and for grinding. — D. Hampson, Middletown, N. Y.



Cutting a Spirally Grooved Roller in a Planer without the Use of Expensive Machinery

KINKS FOR THE BUILDER



Simple Framing for
a Cove Ceiling



Shingles Nailed to Planks
Prevent End-Splitting



Glass Supported on Blocks
Is Less Likely to Crack

Useful Roller for
Handling Long
Timbers



Wood Protector for
Projecting Pipe

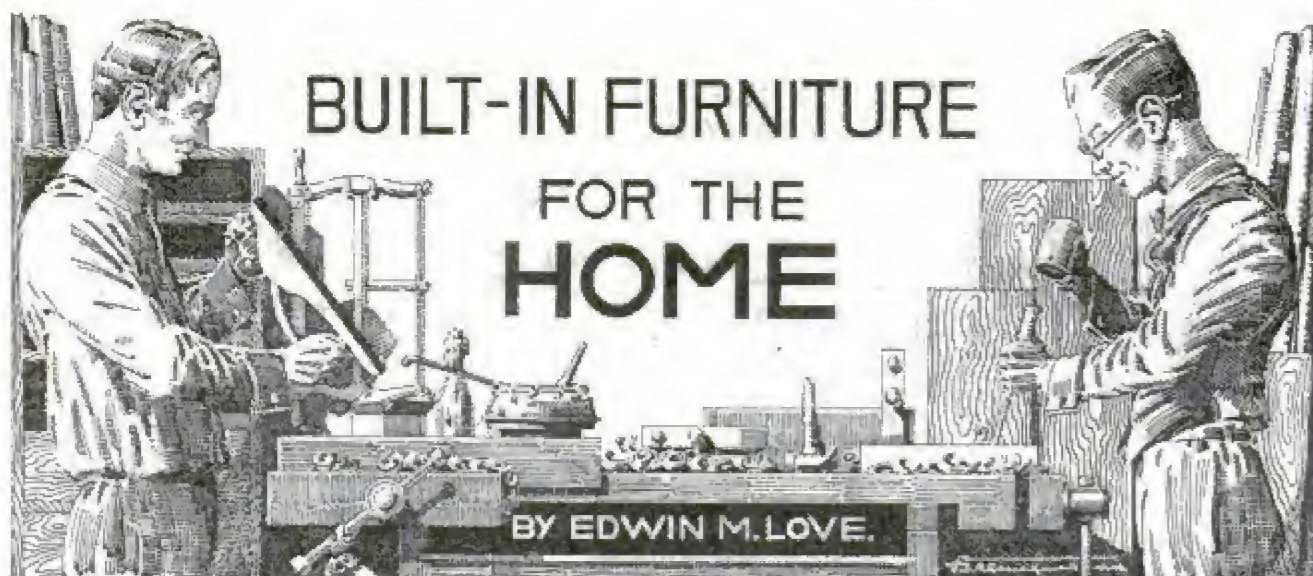


Stovepipes Set in Forms and
Filled with Sand Provide
Openings in Concrete Floor

Old Nail Kegs Make
Pier Forms



Preventing Cable
from Cutting Tree



Part XIV—Sewing Cabinet

ASIDE from the novelty of being built into the wall, the sewing cabinet illustrated herewith has numerous worthwhile features to recommend it. The door opens to a horizontal position, and can be used as a cutting table. Six drawers, hinged to open out completely, and a bin nearly 1 ft. square, also hinged, besides shelves, furnish ample storage space, while the partitioned drawer for buttons, the pivoted spool rack, and a work basket built to fit snugly in the remaining space, take care of sewing equipment.

As this piece fits between four studs without any being cut, it is built in three separate sections before being assembled with the casing. All are built of 1 by 5-in. stock, sized to a width of $4\frac{1}{2}$ in. For the six side jambs, cut stock 2 ft. 2 in. long, and rabbet each end on the face side to a depth of $\frac{3}{8}$ in. and a width of 1 in., leaving a face side length of 2 ft. Lay out one and use it as a measure for all others. The six top and bottom jambs are exactly $12\frac{3}{4}$ in. long.

Select a pair of side jambs for the left-hand compartment. Measure up from the bottom shoulders, $4\frac{1}{4}$ in., locating the upper edges of $\frac{3}{8}$ -in. dados cut $\frac{1}{4}$ in. deep. The tops of the next pair are $3\frac{1}{2}$ in. above these. The bottoms of the $\frac{3}{4}$ -in. gains for the heavy shelf are $3\frac{1}{2}$ in. above the top of the one just cut.

Make the three shelves 5 in. wide and $12\frac{1}{2}$ in. long, and assemble this section of the cabinet. Nail the outer corners both directions with four-penny finish nails. Sight along the side jambs to be sure that they have not been bulged outward by the shelves, and nail through into the thick middle shelf. Now notch the projecting $\frac{3}{4}$ in. of the shelves by squaring lines flush with the inside faces of the jambs and sawing to the jambs, the waste wood being

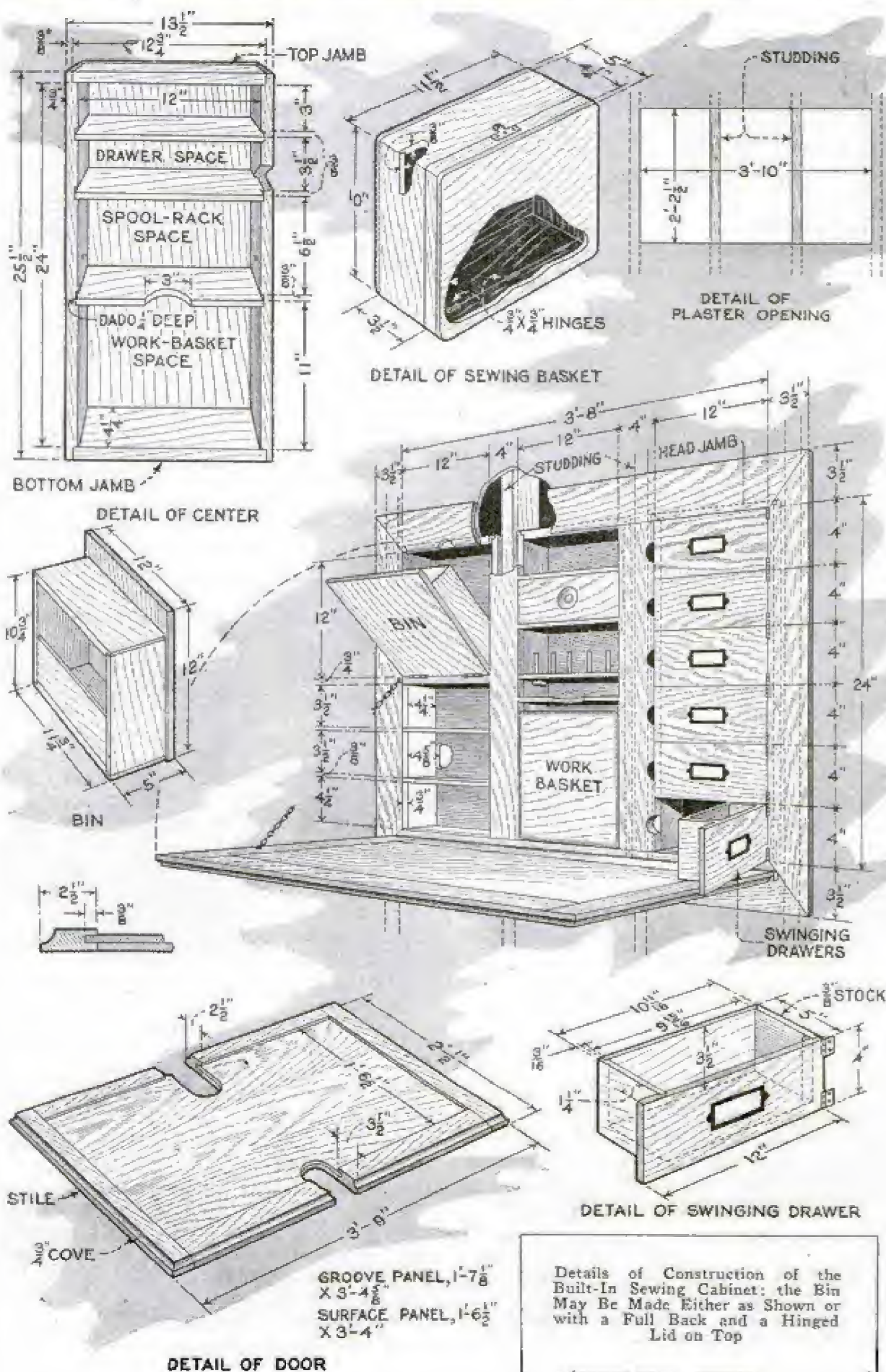
chipped out with a chisel. Square up the box and tack a diagonal brace across the back.

Build the center section in the same way, this time placing the top of a $\frac{3}{8}$ -in. shelf 11 in. above the lower jamb, a second shelf $6\frac{1}{2}$ in. above this, and a third, $3\frac{1}{2}$ in. above the second. In the center of each jamb, $1\frac{1}{4}$ in. above the lower shelf, bore a $\frac{3}{8}$ -in. hole for a pivot bearing of the spool rack. Cut from the front of the lowest shelf a semicircular segment having a radius of $1\frac{1}{2}$ in., to give finger room for removing the work basket from its recess.

The section at the right consists merely of the jambs, as it is filled with the six pivoted drawers without recourse to rails or shelves:

Assemble the three sections by tacking on the casing muntins of 1 by 5-in. stock, sized to a width of 4 in. and cut to 2 ft. in length. The edges are flush with the inside faces of the jambs. Cut the upper and lower casings of 1 by 4-in. stock, mitering the ends, and nail them solidly to the head jambs of the sections with six-penny finish nails. Fit the side casings and nail them in place. Now lay the cabinet, face down, on the bench or floor, place smooth blocks under the miters of the casings, and drive two $\frac{1}{2}$ -in. corrugated fasteners into each. Remove the braces from the back and cover the sections with $\frac{3}{8}$ -in. three-ply pine or fir panel veneer, cut 1 ft. $1\frac{1}{2}$ in. by 2 ft. $1\frac{1}{2}$ in., one for each section, nailing them on with shingle nails or six-penny finish nails.

For the spool rack, make a rectangle of $\frac{3}{8}$ by 5-in. stock, $4\frac{1}{2}$ by $11\frac{7}{8}$ in. in size, and gauge on the face side a pencil line 1 in. from each edge. Centering on these lines, bore six holes $\frac{3}{16}$ in. in diameter, spacing them 2 in. apart; the end ones being $\frac{15}{16}$



in. from the ends of the material. Make two lugs of $\frac{3}{8}$ -in. stock, $1\frac{3}{8}$ in. wide and $1\frac{1}{2}$ in. long, one end being semicircular and the other square. Glue these to the underside of each end of the rectangular piece, as shown in the detail, and bore a $\frac{3}{8}$ -in. hole, 1 in. deep, in the $\frac{3}{4}$ -in. stock thus built up. Cut two $1\frac{1}{2}$ -in. lengths of $\frac{3}{8}$ -in. hardwood dowel for the pivots.

Make the rack pins of $\frac{3}{16}$ -in. doweling, cut $2\frac{1}{2}$ in. long and rounded on the upper ends. Glue these in the holes bored for them. Put glue inside the pivot sockets and slip the rack into place between the holes in the side jambs of the center section. Slip the pivots into place from the backs of the stiles, and allow the glue to set. Glue to the back a small block to act as a stop.

To build the work basket, cut from $\frac{3}{8}$ by 10-in. stock two rectangles, $9\frac{3}{4}$ by $11\frac{1}{2}$ in., for the top and bottom. The two sides are $3\frac{1}{8}$ by $11\frac{1}{2}$ in., rabbeted at each end $\frac{3}{8}$ in. wide and $\frac{7}{16}$ in. deep for assembling with the ends in the same manner as the cabinet sections. The ends are $3\frac{1}{8}$ in. wide by $9\frac{5}{8}$ in. long. Size the ends of the endpieces with thin glue, and assemble ends and sides by gluing and nailing with 1-in. brads. In nailing, avoid putting brads where a line drawn $1\frac{1}{8}$ in. from the top of the box would pass over one. Nail and glue on top and bottom, carefully smooth the box, and gauge a line $1\frac{1}{8}$ in. from the top all around the box. Cut around this line, separating the top from the bottom. Smooth up the edges, and see that the lid fits with a tight joint all around, without any rocking. Round off the outside corners, and hinge the lid to the box with three $\frac{3}{4}$ by $\frac{3}{4}$ -in. brass hinges. Fit a light clasp in front.

The bin in the upper part of the left section is built in much the same manner. The frame formed by the sides is $10\frac{3}{4}$ by $11\frac{3}{4}$ in., the sides being of $\frac{3}{8}$ -in. stock, $4\frac{1}{4}$ in. wide. The front is $\frac{3}{8}$ in. thick

and 12 in. square, glued and nailed on the frame to show a projection of $\frac{1}{8}$ in. on three sides and $1\frac{1}{4}$ in. on the top. Fit a lid and back to this of three-ply panel veneer, and hinge the lid by means of $\frac{3}{4}$ by $\frac{3}{4}$ -in. hinges inside. Fit the bin to its compartment, leaving a joint of less than $\frac{1}{16}$ in. all around the front, which forms the outside of the bin when it is closed into the recess. Hinge to the lower shelf. No catch is needed, as gravity holds it in position. To hold it horizontal when opened, attach a thin strip of leather to

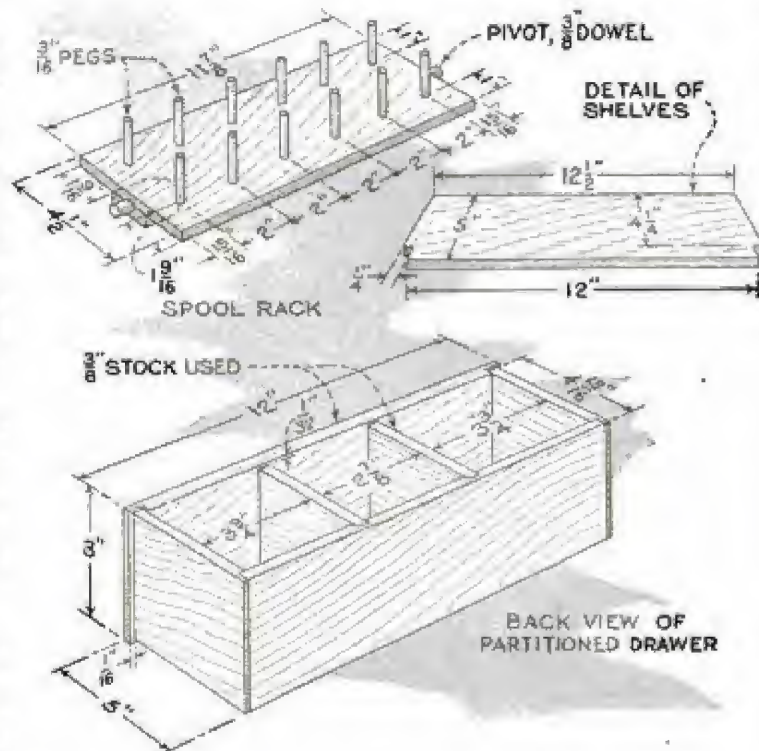
the back of the bin and the shelf, so that it will be drawn tight when the bin is opened.

The detail of the partitioned drawer gives the dimensions. Rabbet the ends into the front and the back into the ends, and dado the front ends of the partitions into the front $\frac{1}{4}$ in. Butt the other ends to the back, and nail the bottom over all. Back, ends and partitions are all of $\frac{3}{8}$ -in. stock, $2\frac{9}{16}$ in. wide, which

gives $\frac{1}{32}$ -in. clearance top and bottom; $\frac{1}{16}$ -in. clearance is given in width. Fit the front closely by beveling ends and edges.

The six swinging drawers are all alike. Make the fronts $\frac{3}{8}$ by 4 by 12 in., and $1\frac{1}{4}$ in. from the left ends, inside, cut $\frac{3}{8}$ -in. dados, $\frac{1}{8}$ in. deep. Rabbet the other ends $\frac{3}{16}$ in. deep and $\frac{7}{16}$ in. wide. The sides that fit into the dados are $4\frac{3}{8}$ in. long, rabbeted $\frac{3}{16}$ in. deep and $\frac{3}{8}$ in. wide, to receive the backs. The other ends are cut $4\frac{7}{16}$ in. long. The inside depth of the drawers is $3\frac{1}{2}$ in., which gives a front projection over the bottom of $\frac{1}{8}$ in. It is necessary to set the ends back, as shown, so that they will clear when the drawer is being opened or shut. Reinforce the hinge joint by gluing in a $\frac{3}{8}$ -in. quarter-round, and fit and hang the lowest drawer. Fit and hang the others consecutively.

Build the door stiles and upper rail of $1\frac{1}{8}$ by 3-in. stock, sized to $2\frac{1}{2}$ in. in width, and the lower rail of 4-in. stock, sized to $3\frac{1}{2}$. Make the panel groove $\frac{3}{8}$ in. from



the inside, so that, after assembly of the door a second sheet of panel veneer may be fitted over the first to make the inside flush. Work a $\frac{3}{4}$ -in. cove on the outside of the door, as shown. Hang it with three

cabinet is to be placed, locate a studding space 3 ft. from the floor and chip off plaster to the edge of a stud. Four feet from this point expose another stud. Level a line between the two, 2 ft. $4\frac{3}{4}$ in. from the

MATERIAL LIST

- | | |
|--|--|
| 1 piece, $1\frac{1}{8}$ by 3 in. by 8 ft., pine or fir, S4S, sanded. | 1 piece, $\frac{3}{8}$ by 5 in. by 12 ft., pine or fir, S4S, sanded. |
| 1 piece, $1\frac{1}{8}$ by 4 in. by 4 ft., pine or fir, S4S, sanded. | 1 piece, $\frac{3}{8}$ by 5 in. by 8 ft., pine or fir, S4S, sanded. |
| 1 piece, 1 by 5 in. by 14 ft., pine or fir, S4S, sanded. | 1 piece, $\frac{3}{8}$ by 4 in. by 6 ft., pine or fir, S4S, sanded. |
| 1 piece, 1 by 5 in. by 12 ft., pine or fir, S4S, sanded. | 1 piece, $\frac{3}{8}$ by 20 in. by 7 ft., three-ply pine or fir panel veneer. |
| 1 piece, 1 by 4 in. by 14 ft., pine or fir, S4S, sanded. | 1 piece, $\frac{3}{8}$ by 16 in. by 7 ft., three-ply pine or fir panel veneer. |
| 1 piece, $\frac{3}{8}$ by 12 in. by 4 ft., pine or fir, S4S, sanded. | 9½ pair, $\frac{1}{4}$ by $\frac{3}{4}$ -in. hinges. 1 desk chain. |
| | 1½ pair, $2\frac{1}{2}$ by $2\frac{1}{4}$ -in. loose-pin butts. |

Cost of materials, about \$12. Time to build, about 20 hours.

$2\frac{1}{2}$ by $2\frac{1}{4}$ -in. loose-pin butts, choosing a kind that can be closed backward to a right angle. Countersink the holes on the backs and put on wrong side out, which will bring the pin underneath the door, thus offering little hindrance to the opening of the lower drawer. Put a desk chain on the left end of the door.

Having chosen the place where the

floor, and another 2 ft. $2\frac{1}{2}$ in. above that. Plumb lines down the inside edges of the studs and remove the lath and plaster from the inclosed rectangle by cutting the



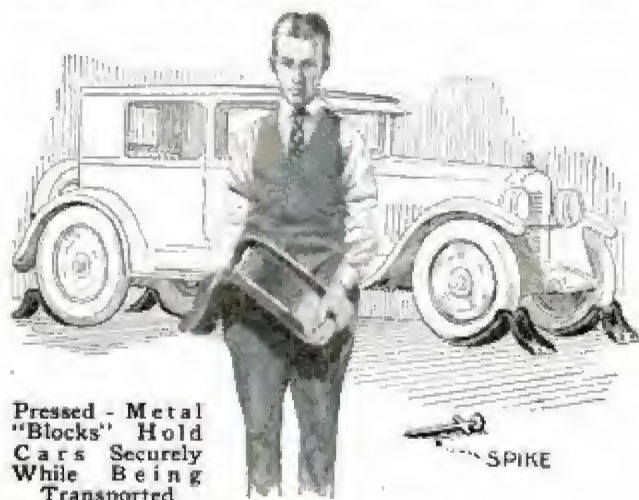
Here Is a Sewing Cabinet That Will Appeal to Every Home-Owning Housewife; It Provides a Place for Everything Used in Sewing and Mending

plaster with a cold chisel and laths with a compass saw. Set the cabinet in place, leveling carefully. Then nail the casings to the studding with eight-penny finish nails. If the plaster keys interfere with the cabinet going back to place, carefully break them off.

Removing the casing muntins, wedge the jambs, and nail through into the studding. Then nail the muntins permanently in place. Cut the curved depressions opposite each drawer and the bin for finger holds, and sand the cabinet preparatory to finishing. It is useless to putty nail holes or joints before the priming coat or stain is applied, since the dry wood will absorb the oil from the putty and loosen it.

Metal "Blocks" Hold Autos in Transit

A well-known automobile factory is now using a pressed-steel blocking brace



in loading autos on freight cars for shipment. Stronger than the old-time wooden blocks, these are easier to apply and remove, hold securely, and may be used over and over. A special type of spike is used, having a $\frac{1}{2}$ -in. shoulder under the head, which permits easy withdrawal and at the same time assures a secure hold. —Richard C. Tarr, Gloucester, Mass.

Tempering Small Articles Evenly

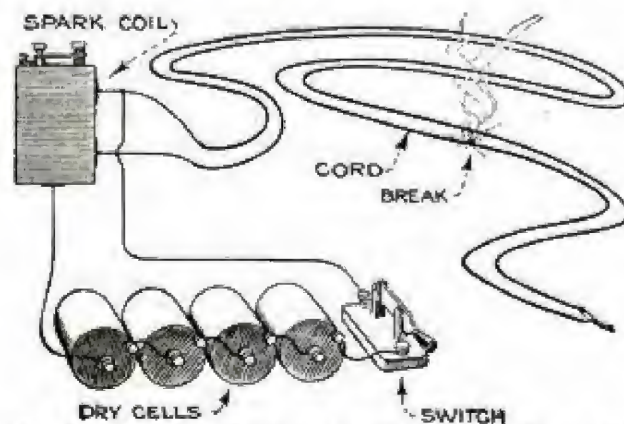
It is quite difficult to temper a lot of small springs or other small articles and have the temper equal in all parts of each piece. The following process will produce the desired effect: Obtain a small cup which is pressed from one piece of metal, or a pieced cup with hard-soldered seams. Partly fill the cup with some animal or fish oil. Petroleum products are not good on account of their volatility. The articles

are heated to the usual color and plunged into the cup, which is to have sufficient oil in it to cover them. After being thus hardened, the cup with the oil and the articles is held over the fire until the oil takes fire and burns. After the temper has been drawn sufficiently, the cup is removed from the heat and a cover placed over it to quench the flames. When cool, the articles are removed. They will be found evenly tempered.

In tempering springs, I usually allow the oil to burn about six minutes before quenching. As the oil can be heated to only a certain temperature, the articles receive a perfectly even heat. If the oil is burned off from the article while it is only smeared with oil, some parts will be heated more than others. If a spring is made of piano wire, it will be greatly stiffened and improved by heating it to an even blue after it is formed. The reason for this is that when the wire is coiled the metal is full of strains which the heat removes. —J. H. Beebee, Rochester, N. Y.

Locating Breaks in Electric Wiring

Many feet of valuable extension cord are wasted, and often an entire cord thrown away because of the difficulty of locating breaks in the wires concealed by the insulation. A simple method of locating these breaks is to connect the terminals at one end of the cord to the high-tension terminals of a Ford spark coil and short-circuit the other ends of the cord. If the battery terminals of the coil are then connected to three or four dry cells, arranged in series, as shown in the drawing, a hot spark will jump across the break in the wire, and its location can easily be detected by the noise and by the

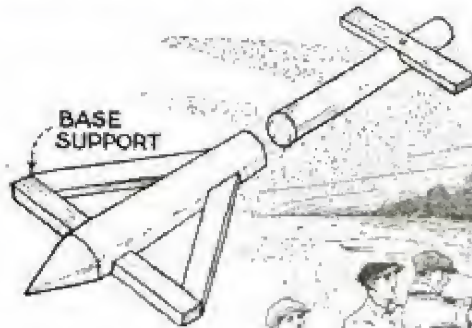


The Break in the Cord Is Located by the Noise and the Burning of the Insulation

burning of the insulation which will appear near the spot.—A. F. Gettelman, Madison, Wis.

Easily Made Derrick

Farmers and others often need some means of raising heavy weights, such as logs, timbers, stones, pipe and machinery onto a wagon or truck. This can very easily be done by constructing a derrick



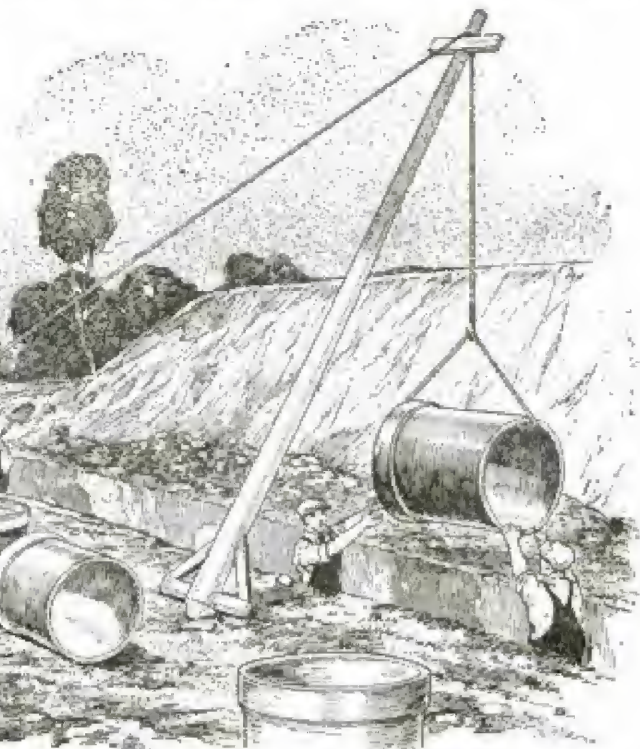
Simple Improved Derrick for Farm Use Which Makes It Possible to Lift Objects of Considerable Weight

of the kind shown, which is both inexpensive and portable. One end of a sound log or 6 by 6-in. timber, about 15 ft. long, is sharpened and base supports nailed on as shown. At the other end a short cross-arm is attached with bolts or nails. To raise a heavy object, the sharpened end of the log is placed in the ground, and a hitch is taken around the crossarm with a rope, which is fastened to the weight, and should be long enough to reach to the ground when the pole is raised. Lifting power is supplied by a truck, horse or a group of men. When the weight is raised to the proper height, it can easily be pulled onto a wagon.—A. Bereskin, Winnipeg, Can.

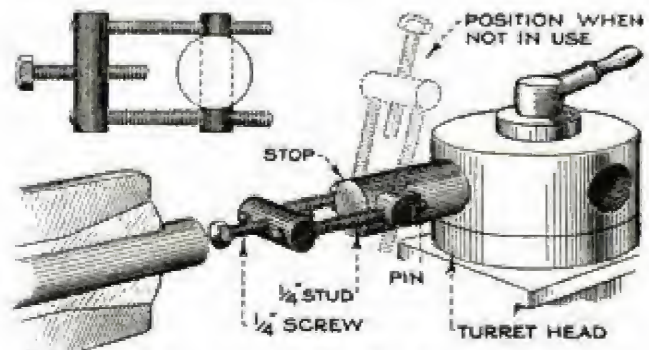
Releasing Tight Collets

Spring collets that stick are a common trouble on handscrew machines. This may be the result of several causes; the rod being used may be old and rough, or it may be bent or a shade too large for the collet. When a rod fails to come forward as the clutch is released, the best thing to do is to tap it lightly on the end projecting through the collet; this loosens the latter and allows the rod to feed forward to the stop in the turret. Sometimes this is a frequent occurrence, and many operators keep a hammer handy for tapping the rod back when it sticks. The drawing illustrates a better way. The stop itself has a $\frac{3}{8}$ -in. cold-rolled stock tapped at each end for $\frac{1}{4}$ -in. studs, which

carry another piece of $\frac{3}{8}$ -in. stock on their outer ends. A hole is drilled and



tapped in the center of the outer piece for a $\frac{1}{4}$ -in. screw. When a rod refuses to feed forward to the stop, the position of the latter being controlled by a stop on the machine, the device is dropped to a horizontal position where a pin driven through the stop holds it. The end of the rod is then tapped by bringing the turret forward, and as the collet releases it, the device is lifted back to the position indicated by the dotted lines, leaving the end of the stop free to locate the rod as usual. A device of this type enables the operator to keep up the regular swing of



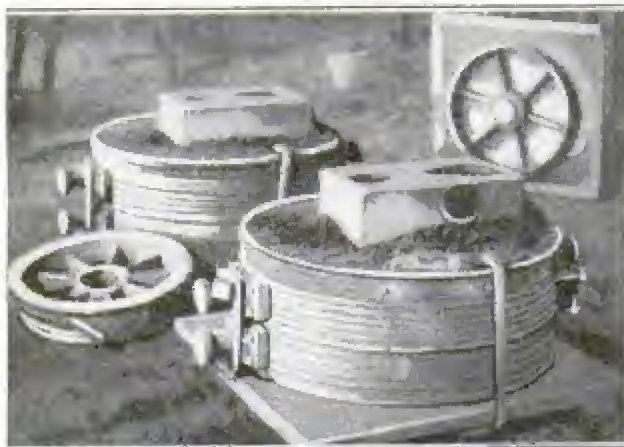
Attachment for Handscrew Machine for Releasing Stock That Sticks in the Collet

the turret, which is impossible when he must stop and pick up a hammer.

Oil paint has a tendency to wrinkle upon exposure to extreme cold but this may be prevented by adding a little turpentine to the paint.

Foundry Flasks from Truck Wheels

A foundry in the middle west received an order for some 24-in. wheels and gears but had no flasks suited to the job. As the order was likely to be repeated, it was



Old Automobile Rims Used as Flasks in Foundry

decided to make flasks specially adapted to that work alone. The ordinary round flask made of cast iron was rejected as it was too heavy. In the yard there were some old truck tires with the inside steel rim left on, and someone conceived the idea of stripping the rubber off and using these steel rings, as they were as near the diameter and width as could be desired. The old rubber was cut through with a metal band saw and was peeled from the rim. For ease in handling, particularly in turning over to dress the mold, a pair of iron trunnions were attached to each ring. The plan was so successful that later more of the flasks were made in another size for other work. Naturally the cost of the flasks was extremely low.—Donald A. Hampson, Middletown, N. Y.

Bending Ford Bendix Setscrew Washer

It is rather difficult to bend up the lip on the lock washer under the bendix-head setscrew on Ford-starter motors when replacing them. If a punch and hammer are used, the shaft turns at each blow and greatly lessens the effect, and an ordinary pair of pliers will not compress with enough force to bend the washers. A simple method is to grasp the partly bent lip on the washer and the screw head in a pair of pliers and turn the bendix until the pliers rest against the frame of the car. Now hammer on the opposite jaw of the pliers until the washer is bent, keeping a strong grip on the plier handles.

Shellac and Graphite Replace Gaskets

Powdered graphite and ordinary orange shellac, when mixed to the consistency of putty, form a solid sealing gasket, which resists heat and holds pressure. This mixture is also of use for small cracks in the water system around radiators, or various places where slight leakage occurs. If used to seal slight crevices, it should be made quite thin and worked into the crack with a putty knife.

Keeping Tractor Oil Warm in Cold Weather

Lubrication of tractors during cold weather presents the problem of keeping the oil thin. A good method of doing this is to arrange a tight-fitting box over the exhaust pipe, so that quite a bit of heat will be retained in the box. The oilcans are kept in it, and freely running oil will then be had in the coldest weather. For drying wet mittens and gloves this box is also a great convenience.—G. G. McVicker, North bend, Nebr.



Keeping Lubricating Oil Thin during Cold Winter Weather in a Box Built over the Exhaust Pipe

Maximum Comfort in Story-and-a-Half Home



Plan No. 5A1



Copyright, Architects' Small House Service Bureau

THIS is a one-and-a-half-story home, planned to meet the most exacting modern requirements and to provide comfort, convenience and a pleasing exterior at reasonable building outlay. There are five main rooms, bathroom, six closets, basement with heater room, and large light laundry.

The living room is everything that its name implies. It is a large, light room, with windows on three sides and a fireplace for winter comfort. It has the unusual advantage of opening both from the front and side hall. Notice, in fact, how easy it is to get from one part to another of this home.

Among the conveniences are the coat closet in the front hall; the broom closet and the general utility closet in the side entry. On the second floor there is a shelved linen closet. The kitchen is planned so all the fixtures are within easy reach. The ice box, though in the kitchen, is iced from outside. Both bedrooms have windows on two sides, and each has its own large closet. The bathroom is over the kitchen, an economical plumbing arrangement, as one stack can be used for both kitchen and bathroom.

The plan shown is drawn for lots facing east or south, while in the house pictured

it has been reversed, making it suitable for lots facing north or west.

Home Builders' Questions

Q. Can anything be saved by doing without a general contractor and letting separate contracts for the different kinds of work? **A.** On paper it may seem less expensive to build with separate contracts. Practically in order to save anything, one must be sufficiently skillful in purchasing materials and in handling labor to offset the corresponding skill of the general contractor. Generally speaking, the hazard is not worth taking. A good contractor can build your house, put everything into it that you want, get it built better than you could, and then, after adding his profit, turn it over to you for less than you could by handling the subcontracts yourself.

Q. Is it necessary to have a set of specifications, if I have a complete set of plans? **A.** Yes. The plans show what is to be done. The specifications tell how it is to be done. The final cost of your house built without specifications may be much more than it would have been if you had had good specifications.

Q. What is the best way to turn a corner with a soldier brick course? **A.** Lay bricks at the corner flat.

Q. What is the cause of rust running down the kitchen wall from the hole where the vent pipe from the gas range comes through the plaster? **A.** This is caused by the warm air from the gas range coming into contact with the cold walls of the pipe which condenses the moisture from this warm air. The difficulty can be overcome if a drip is run from the bend of the pipe so that the water of condensation drips onto the basement floor. It is very difficult to overcome this condition in an old house without unreasonable expense.

Q. Is it safe to build an eight-inch brick wall to a height of ten or twelve feet? **A.** An eight-inch brick wall laid of good bricks and in good mortar is a substantial wall in the height you mention.

QUESTIONS regarding home building addressed to this magazine will be answered by the Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the department of commerce, United States government. Blueprints, specifications and material lists for the house shown above may be obtained at a nominal cost. Inclose self-addressed, stamped envelope for reply. If further information is desired send five cents and stamped envelope for a 24-page booklet explaining how the small home bureau functions and showing twelve sample plans.

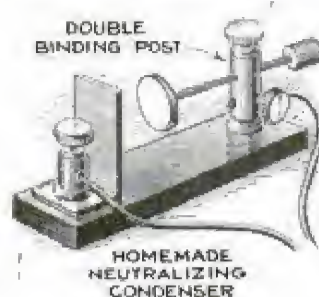
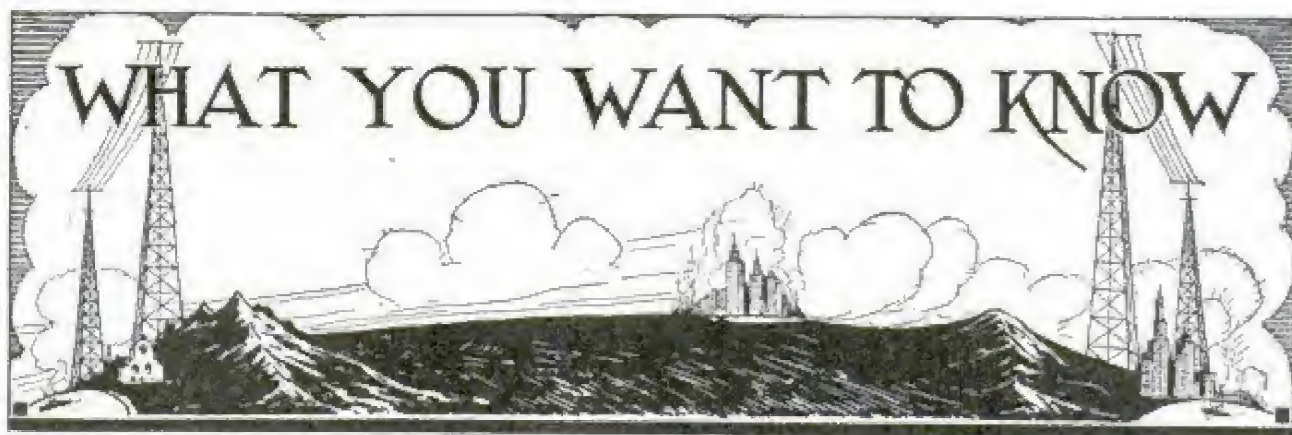


Fig. 1

copper disk, about the size of a penny, soldered to the end of a threaded brass rod or long machine screw. The upper hole in the double binding post is threaded to take this rod, and a hard rubber or composition binding post head makes a good knob. Mount this unit on the subpanel at a convenient distance from the stationary unit.

Q. Please send me a schematic diagram of a simple one-tube set showing a wavetrap drawn in the circuit. A. The diagram for the circuit, including a wavetrap, is given in Fig. 2. There are several methods of using the trap, but the method shown is in common use, and adds greatly to the selectivity of the set.

Q. What are the approximate points on the dial where I can find the different wavelengths of the stations as they are listed? A. In most receivers the short-wave stations come in on the lower end of the dial. A receiver covering a range of 200 to 600 meters would tune in the 200-meter station at 0 on the dial, and 600-meter stations at about 100. At 50 on the dial, you could expect to find stations ranging around 300 meters.

Q. What ratio is best for the average two-step amplifier? I have several a.f. transformers of different ratios and want to use the best possible combination. A. For good results two 3½-to-1 ratio a.f. transformers work to the best advantage in the average set.

Q. What is the proper size of grid condenser to use with a three-circuit receiver? A. The grid condenser may be either .0005 or .00025 mfd. The latter capacity is commonly used in manufactured sets. Tubes vary, however, and it is best to try both values.

Q. I am having difficulty in getting a good ground. The soil here is very dry and sandy; please suggest some type of substitute ground. A. It is almost im-

possible to get a good ground in such soil. A simple counterpoise substitute can be made by stringing one or two wires under the aerial a few feet above the ground. A lead is taken from the counterpoise in the same manner as from the aerial and goes to the ground post on the set. The counterpoise acts as a capacitance giving a condenser effect between the two, and makes a very effective substitute.

Q. What is the best type of wire to use for an aerial? A. Copper wire should be used; if this can be obtained in the enameled form it would be ideal as corrosion would be prevented. Use either No. 14 or 12 gauge wire, or standard antenna wire of the stranded type.

Q. I live in an apartment house and there are several aerials on the roof. One of them parallels my aerial and is about two feet away; will this interfere with my set? A. There will be no interference unless either your set or your neighbor's is of the regenerative type; then, there will be interference due to the radiation qualities of this type of circuit.

Q. What amperage should a fresh dry cell have? There seems to be a difference of opinion among the dealers here. A. Some makes of No. 6 dry cells test 30 amp., others from 17 to 22. A pamphlet can be obtained from the manufacturer specifying the amperage. Some of the

high-resistance types will test low, although they may be fresh and in first-class condition. If a voltmeter is connected across the socket terminals of the set, and the rheostats turned up to the best operating point, the voltage reading should be up to the specified voltage for the tubes. If less, renew the batteries. The tubes should be run against voltage rather than against amperage.

Q. I have several of the old type UV-201A tubes with the brass base. I want to remove the base for an experiment; how can I do this? A. Hold the brass base over a flame as shown in Fig. 3. Slowly rotate the tube and when the sealing compound has melted, the base can be removed.

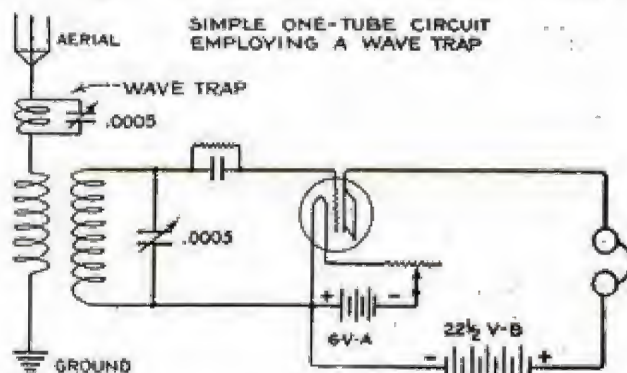


Fig. 2

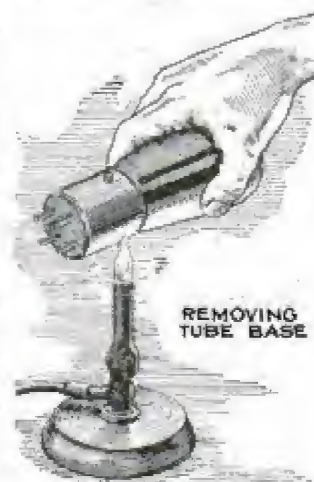


Fig. 3

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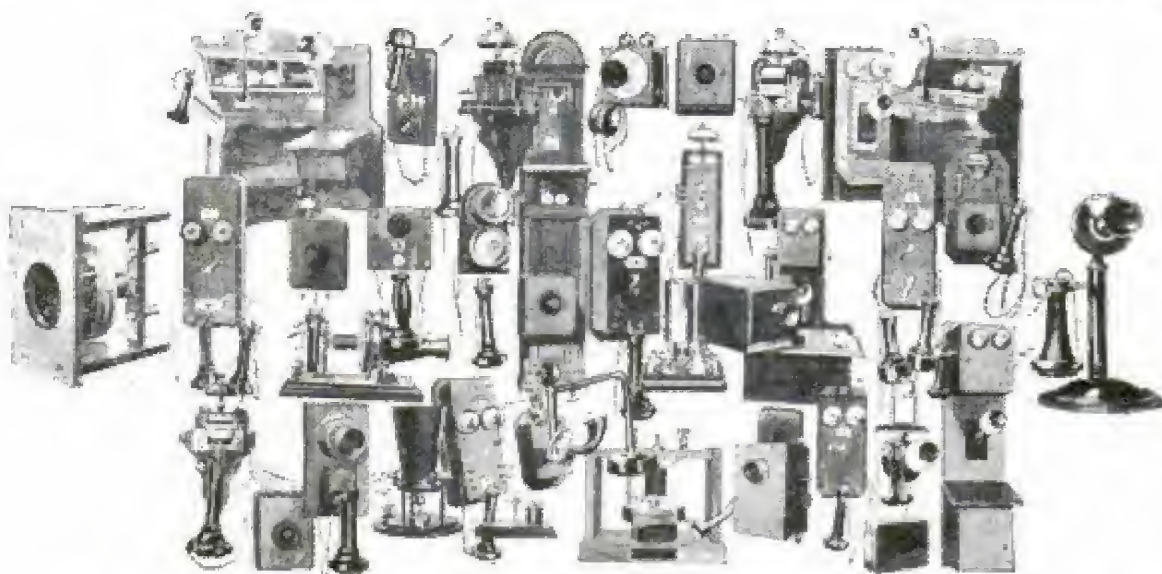
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An Account of Stewardship

FIFTY years ago Dr. Alexander Graham Bell was busy upon a new invention—the telephone. The first sentence had not been heard; the patent had not been filed; the demonstration of the telephone at the Centennial Exposition had not been made. All these noteworthy events were to occur later in the year 1876. But already, at the beginning of the year, the basic principle of the new art had been discovered and Bell's experiments were approaching a successful issue.

The inventor of the telephone lived to see the telephone in daily use by millions all over the world and to see thousands of inventions and developments from his original discovery.

If he had lived to this semi-centennial year, he would have seen over 16,000,000 telephones linked by 40,000,000 miles of wire spanning the American continent and bringing the whole nation within intimate talking distance. He would have seen in the Bell System, which bears his name, perhaps the largest industrial organization in the world with nearly \$3,000,000,000 worth of public-serving property, owned chiefly by an army of customers and employees.

He would have seen developed from the product of his brain a new art, binding together the thoughts and actions of a nation for the welfare of all the people.

AMERICAN TELEPHONE AND TELEGRAPH COMPANY
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The picture above shows you how easily you can get any of five ratchet adjustments on the little "Yankee" Hand Drill No. 1530.

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IN THE PAST twenty years, Fatima has been more widely imitated probably, than any other cigarette—yet today it is as distinctive as ever, in richness of taste, in mildness, in delicacy of aroma. A few cents more, yes—but you get the *real thing*. That's the difference



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you are buying
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— Whether toolmaker, mechanic,
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 line for every need—tools
 necessary for the best work.

If you haven't a copy of our Small Tool Catalog, just
 ask for one at a good tool store—or we'll send a
 copy direct. It will profit you to keep a copy at hand.

“Standard of the Mechanical World”

What I would do if I wanted more money—By J. Matheson Bell

FIRST of all I'd make up my mind definitely that I was going to get it.

I don't believe any man living can get things worth while without *firmly believing* that he can. Determination will conquer failure anytime, anywhere.



"Busted" and Blue

I'll work harder on my present job to make the boss feel that he owes me more.

But I won't stop there.

I'll put my spare time to work.

I'll quit losing money by making my evenings pay.

I wouldn't give up my present job but I'd make more money by working longer hours.

I'd find something that could be sold evenings, either in my home or some one else's home.

That something would have to be a little out of the ordinary because it would have to be of special interest in the evening.

That would be the time of day when both the man and his wife are at home so I'd find something that would be of interest to both of them.



Decides to Work Harder

I feel sure that such an article would have to be something for the home, something they would both use and enjoy.

So far so good, but what will that something be.

Piano?

Fine, but come to think of it I can't even play one myself so that's out.

Automobile—

Sounds better, guess I could learn how, but seems to me that everybody I know has one. At any rate the auto sounds good—let's see if there is anything better.

Phonograph—

Doesn't sound near so good as the auto.

Vacuum Sweeper—



How Can I Make More?

True—I don't know anything about radio, but I have lots of friends who have learned something about it, so I think I could. What sounds good to me is, that I can demonstrate in the home in the evening, the very time of the day for me, and that's just when all the music is being broadcasted.

I'll have competition. I expect it. I'll have to know just what my demonstration will do that the other fellow's won't, so let's see what would make the biggest appeal.



Thinks Hard!

Of course, they would be impressed with music from our nearby stations but I feel sure that if I bring in great distances they will be more impressed.

It will have to bring in music loud enough so they can sit away back in the room and enjoy it. It must have volume. They may be satisfied with music from nearby stations, but they'll ask me for distance, so I must be able to get "by" our powerful nearby station. The radio I want must be selective so I can tune out our nearby station if I desire.

I can picture myself in some prospect's home with a radio that will do that, but I wonder if that is enough—maybe my competitor will be there also—maybe he can do all those things as well as I can.

Then where am I?

I've got it—I'll tell you what my radio must do—I want one that my prospect can do all the tuning, so that he will get the thrill of bringing in the music from a distance *clear and loud* and with a tone that will please.

After all he is the one who is going to operate it, so why wouldn't it be better and best if all he had to do was sell himself. I'll admit I'm not much of a salesman, so if I find a radio that



Gets An Idea—

will sell itself then I'll not only whip competition but I'll do it easily. Best of all, I'll make that extra money I want.

Who knows, I may be so successful at it that I can give up my present job and give it all my time — Gee that sounds too good to be true, but other men have done it so why can't I—I can and I will.

But what radio can I sell that will do what I want and yet sell at a reasonable price—I don't want one so high that my people can't buy—but it must be a good one.

Then when I do sell it, they will want me to fix anything that goes wrong so somebody must teach me how to service radio—that's something I can't afford to overlook.

Where is such a radio?

Where is a manufacturer who will



teach me how to sell and how to demonstrate—where I can learn this business, both selling and servicing radio—there must be someone. There is—Ozarka Incorporated of Chicago—the sign of the long distance goose—they have a 64-page book "The Ozarka Plan" which they will send me if I tell them about myself and mention the name of my county. Where is my pen and some paper? I'm going to make more money and I'm going to start right now by writing for this book.

Use This Coupon!

J. Matheson Bell, Pres., OZARKA, Inc., 120 Austin Avenue P., Chicago, Illinois

I am greatly interested in the FREE Book, Ozarka Plan No. 100, telling how I can establish myself in the radio business and increase my present income.

Name.....

Address.....City.....

County.....State.....

OZARKA



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Chicago, Illinois

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Adjusted to Temperature
Adjusted to Isochronism
Adjusted to Positions
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25 Year Gold Strata Case
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(Including Montgomery R. R. Dial)
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We will send this famous watch, express prepaid, for you to examine, to inspect, to admire, to approve without one penny advance payment. Examine the watch and be convinced it's the best watch buy you ever saw. Just a small payment down, the balance in easy MONTHLY payments. You use the watch while paying for it.

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Artistic, dependable ladies' wrist watches—perfect timepieces, beautiful hand engraved cases in white or green gold. Send for New Watch Book and see the new shapes and designs. Sent on approval and sold on payments.

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Please send prepaid and without obligation your New Watch Book Free, explaining your "No Money Down" Offer on the Santa Fe Special Watch.

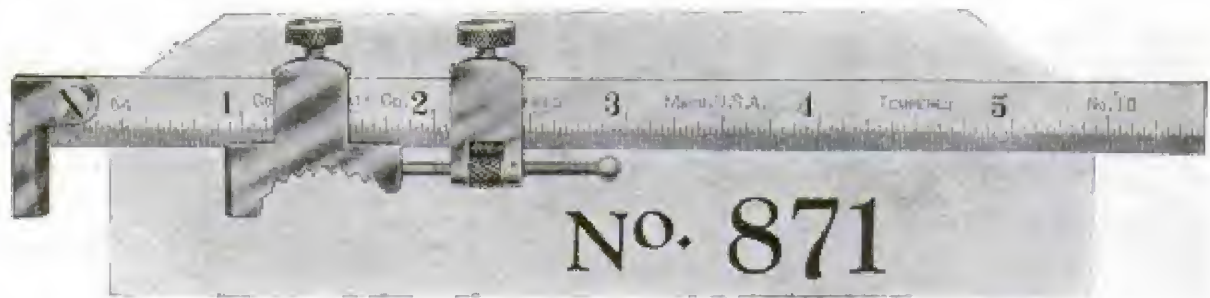
Name

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State

*Men in every walk of life
now wear Strap Watches*





Slide Caliper Rule

A useful tool for close measurements. For especially fine adjustments, the final movement of the thumb slide is made by turning the knurled adjusting

nut. Reversing the slide, the tool can be used as a stop rule. Removing the slide provides a narrow hook rule. The tempered steel rule is 6 inches long, $\frac{3}{8}$ inch wide, $\frac{1}{20}$ inch thick, with either No. 10 or

metric graduation. Packed one in a pasteboard box, weight 2 ounces. Price \$3.50. Slide Caliper Rule, No. 1771, without the fine screw adjustment. Price \$2.50.

Save money, time, trouble

THE amount of effort and expense involved in repairs and replacements around the house—the car—the radio—often depends on the accuracy of your measurements.

Hair-line precision on close work, a snug fit for all parts you buy—such as gaskets, petcocks, washers, bolts, nuts, screws, keys, and pins—absolute accu-

racy of every measurement for which a caliper slide rule and a trammel rule can be used, is insured by these two vest-pocket-size tools.

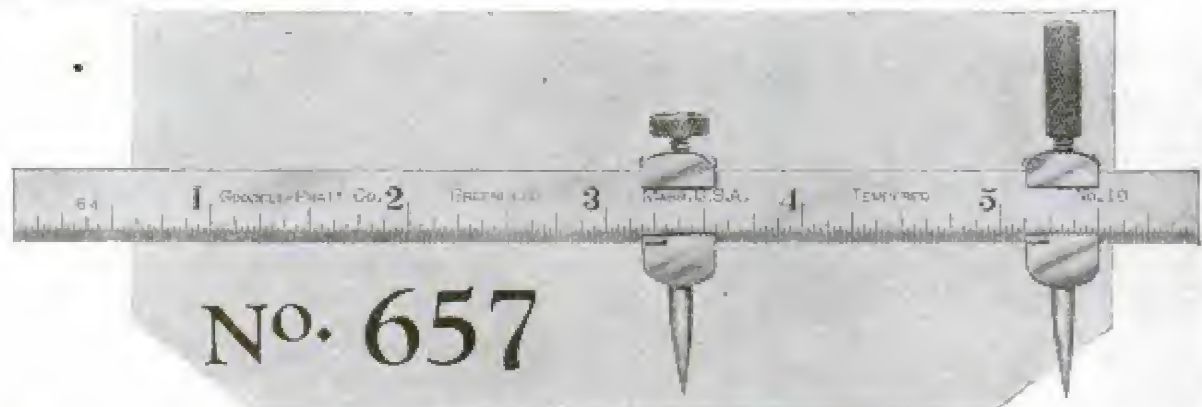
These good tools will be mailed guaranteed, postage-paid, to any point in the United States on receipt of the price. Goodell-Pratt Company, Greenfield, Mass., U. S. A.

Trammel Rule

A compact, handy trammel for all measurements within the capacity of the steel rule which forms the beam. The hardened steel points can be set directly

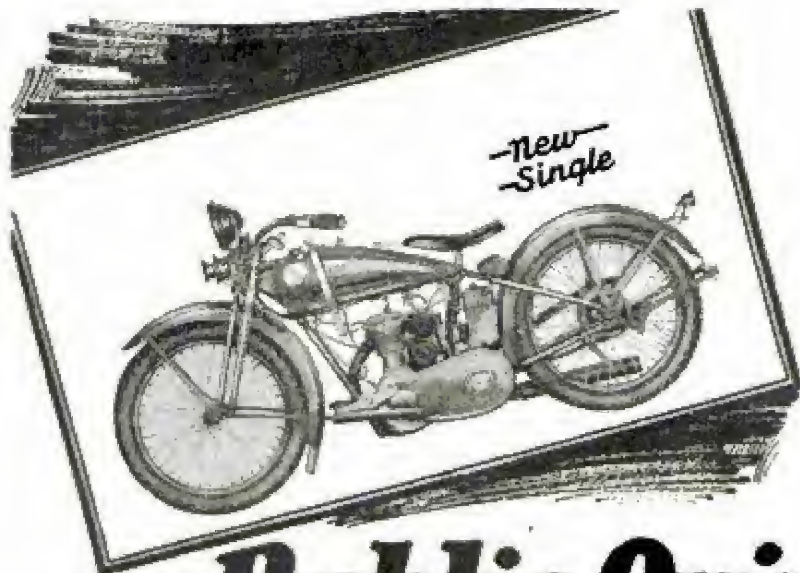
from the graduations on the steel rule. When describing circles the point at the left, with the flat top, is used as the center, and the point at the right the scriber. The tempered steel

rule is 6 inches long, $\frac{3}{8}$ inch wide and $\frac{1}{20}$ inch thick, with either No. 10 or metric graduation. Packed one in a pasteboard box, weight $1\frac{1}{2}$ ounces. Price \$2.50.



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THIS new type of motorcycle represents the ideas of hundreds of men like yourself.

Low price — cheap upkeep — easy to ride. People have been waiting for these features in a motorcycle —and the Harley-Davidson Single is the answer.

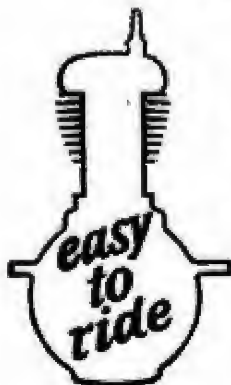
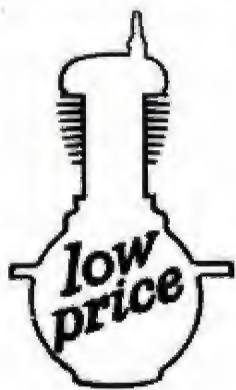
It travels 70 to 80 miles on every gallon of gasoline—800 miles per gallon of oil—10 to 12,000 miles on a pair of inexpensive tires. Comfortably!

No trick to ride it—you learn in a city block. Ample power for any road or hill—amazing, but safely balanced speed. Easy to park and garage.

Your type of motorcycle! You can pay-as-you-ride!

See the "Single" at the Harley-Davidson dealer's. And mail the coupon.

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Ask how others
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Send me FREE, interesting literature showing your 1926 improved "Single".

Name.....

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See our other ad on Page 158

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No better loops at any price. Quantity production keeps prices low. Handsome, convenient and efficient.

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Built for any circuit where it is desired to vary the inductance of the loop. Exceptionally fine for Superhets.

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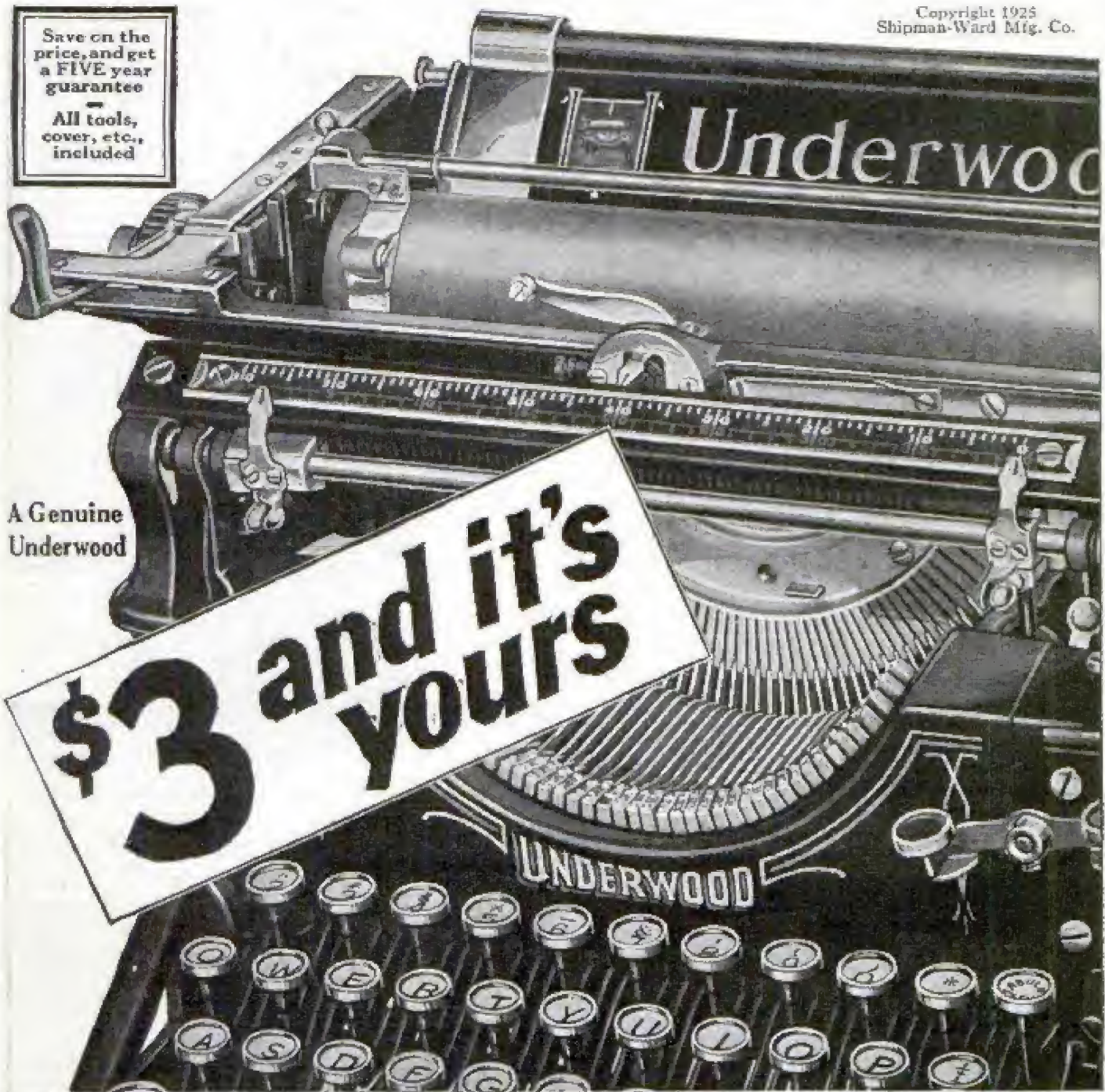
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are as essential to successful operation and pleasing appearance as are Apex Vernier Dials. Royal Brass Finish—60c. Satin Silver Finish—70c. DeLuxe Gold (24K)—80c.

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IMPERIAL 5 Tube Set



Latest, most advanced type 5 tube tuned radio frequency receiver. Greater range, power, selectivity and perfect tone. Why pay more when you can't get more than the new IMPERIAL gives you? Write at once for full particulars of this new, better radio receiver and low price.

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"The World's Standard for Push Pull Amplification"

Use them in your set and you will realize why they are continually specified by leading Radio Engineers. The fact that they are widely copied is proof of their superiority. "Take no chances—use Como."

\$12.50 per matched pair at leading dealers. Send for literature.

Como Apparatus Corp., Manchester, New Hampshire

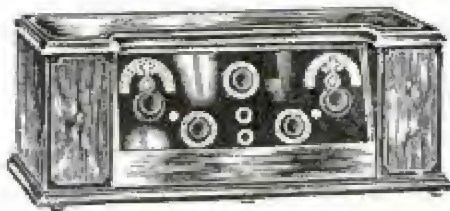
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Crosley Super-Trirdyn Special

The Improved Super-Trirdyn panel is assembled in a new solid mahogany cabinet finished in duotone. This cabinet with its striking lines and simple detail decoration is of ample size to house all dry batteries required for dry cell tube operation..... **\$60.00**

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This new leadership in sales is based on Crosley's new leadership in value; and this latter resolves itself into two simple propositions:

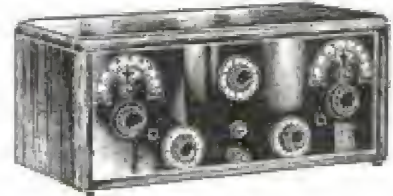
Crosley sets consistently deliver a performance that has no peer in any field of radio—and this matchless performance is offered at the lower prices that only the economies of tremendous production make possible!

On this page are shown four of the new Crosleys—the two famous Super-Trirdyns and the two Special De Luxe models. Not only do they offer an effective beauty and accurate workmanship, but they provide a performance that cannot be surpassed in the \$23.50—\$60 price range or many dollars above it!

Make your own comparison on the basis of selectivity, distance, clarity, and volume. Place the competing receivers side by side with lead-ins from the same antenna, and put them through their paces.

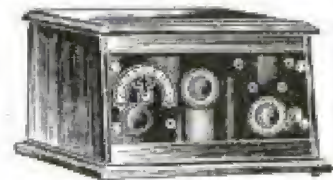
Forget the radical difference in price. Reach your conclusion solely on results. Then and only then will you understand why thousands upon thousands of radio buyers are singling these Crosleys out of the entire field—unwilling to pay more because a greater investment cannot provide greater enjoyment.

See the complete Crosley line at the nearest Crosley dealer's. Address Dept. 15 for his name and our illustrated catalogue.



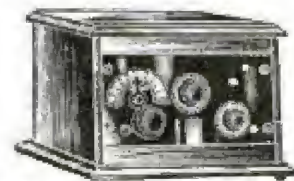
Crosley Super-Trirdyn Regular

Incorporating the famous Trirdyn hook-up, this set brings in stations sharp, clear, and mellow on the Must-cone. The cabinet is of oil rubbed solid mahogany, exquisitely simple in design and beautifully finished. For sheer performance under all conditions the Super-Trirdyn cannot be surpassed..... **\$45.00**



Crosley 3-Tube 52 S. D.

In this improved model are introduced radical refinements that increase its general efficiency. Refinement of parts and improvements in design have made it a truly remarkable value, considering its nominal price. Genuine Armstrong regeneration with the double circuit to reduce radiation to a minimum. Beautifully proportioned with attractive sloping panel. Cabinet holds all necessary dry cells. A genuine long range radio, easy to tune, easy to enjoy, and **\$32.50** easy to pay for.....



Crosley 2-Tube 51 S. D.

This superb long range set combines Armstrong regeneration and one stage of audio frequency amplification. The handsome mahogany finished cabinet, with sloping panel, holds all required dry batteries. Improvements include new worm type tickler, new vernier plate condenser, and a double circuit to minimize radiation. Unusual selectivity and distance, extreme accuracy of control..... **\$23.50**

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THE CROSLEY RADIO CORPORATION, CINCINNATI, OHIO

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Crosley manufactures receiving sets which are licensed under Armstrong U. S. patent No. 1,113,149 and priced from \$9.75 to \$60.00 without accessories. None of the prices quoted include batteries, tubes, headphones, etc. Add 10% to all prices west of the Rocky Mountains.



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Send 10c in stamps for illustrated catalog describing marvelous Vicam Products.

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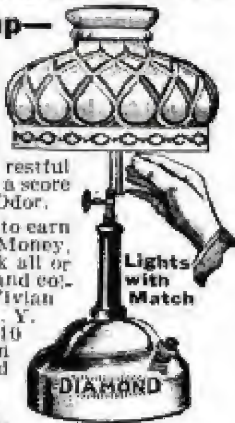
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New 300 Candle Power Lamp— Burns 96% Air

Introduce wonderful patented invention. Burns only 4% fuel—cheap kerosene or gasoline. Uses less than wick lamps. Greatest advancement in lighting of the age. Table lamps, wall lamps, hanging lamps, lanterns. Powerful, brilliant, soft, restful white light—like daylight. Brighter than a score of wick lamps. No Smoke—No Soot—No Odor.

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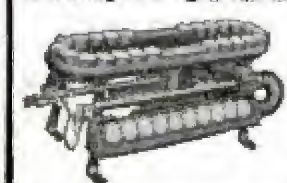


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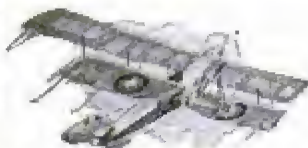
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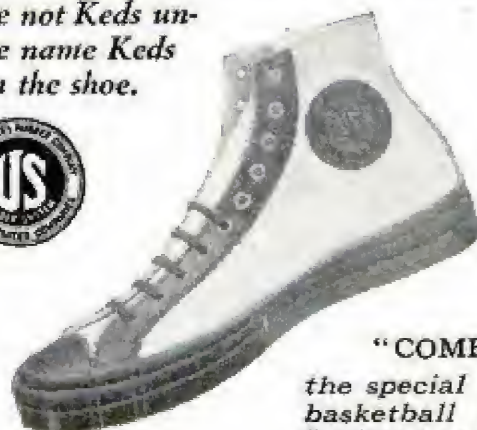
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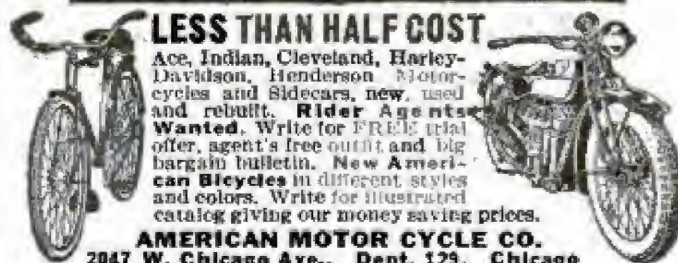
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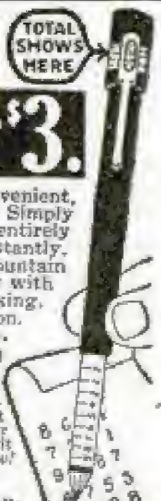
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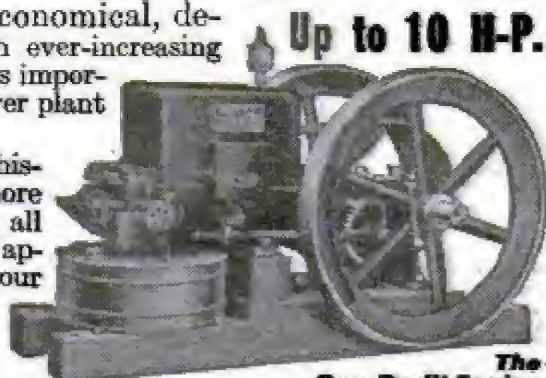
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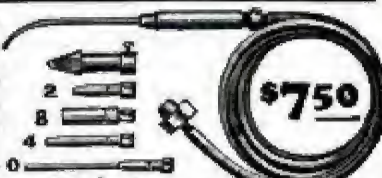
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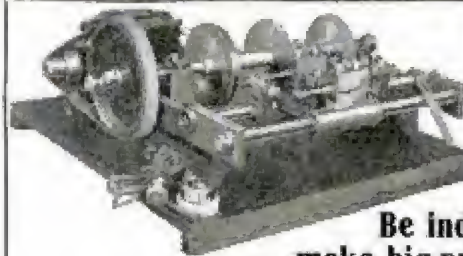
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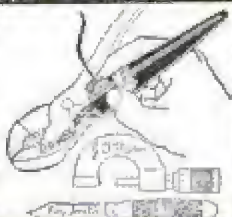
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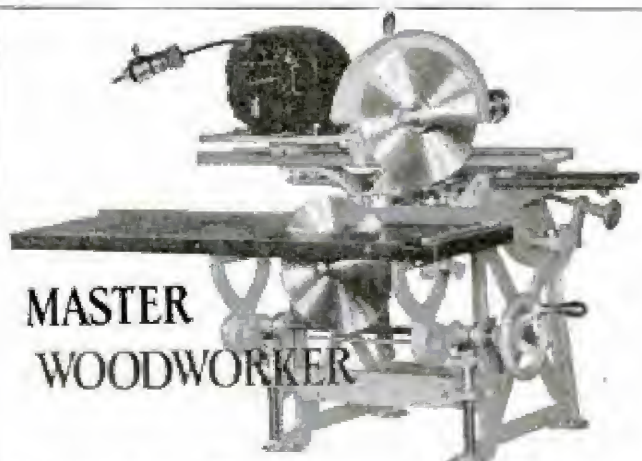
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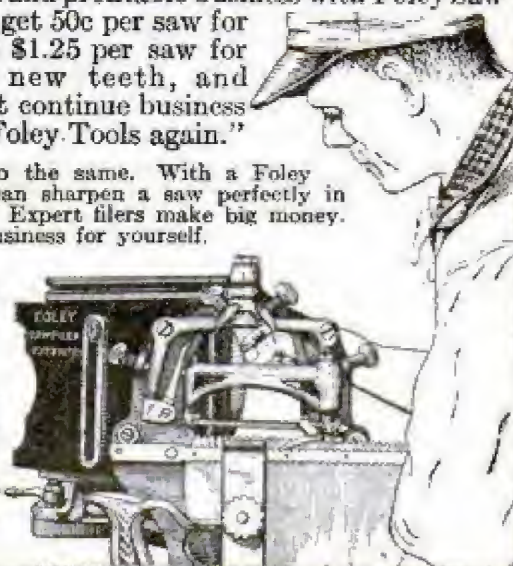
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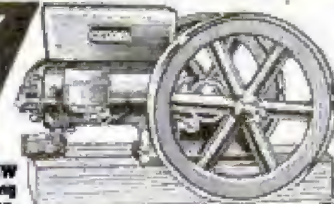
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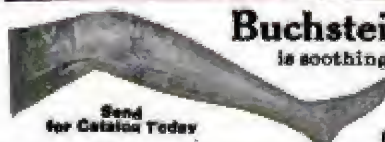


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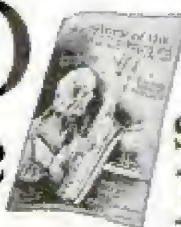
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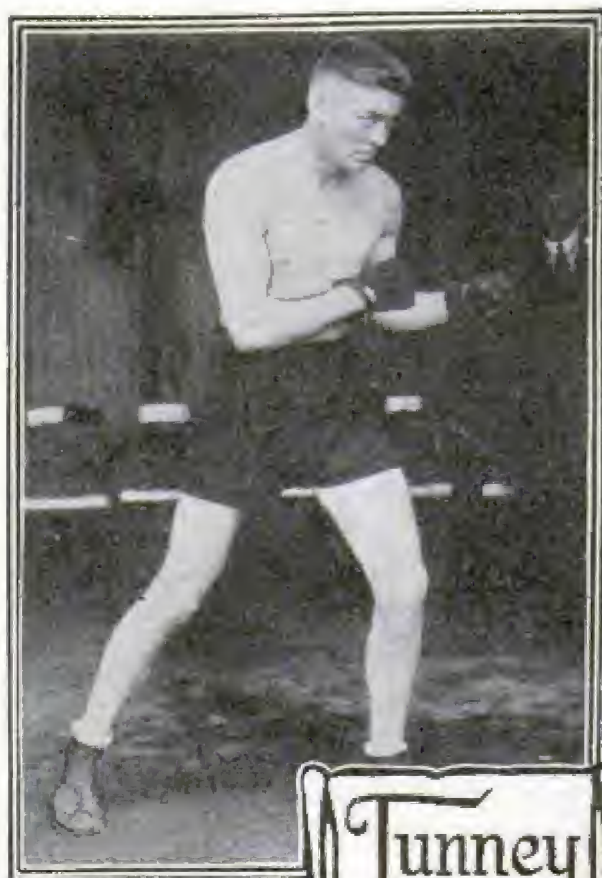
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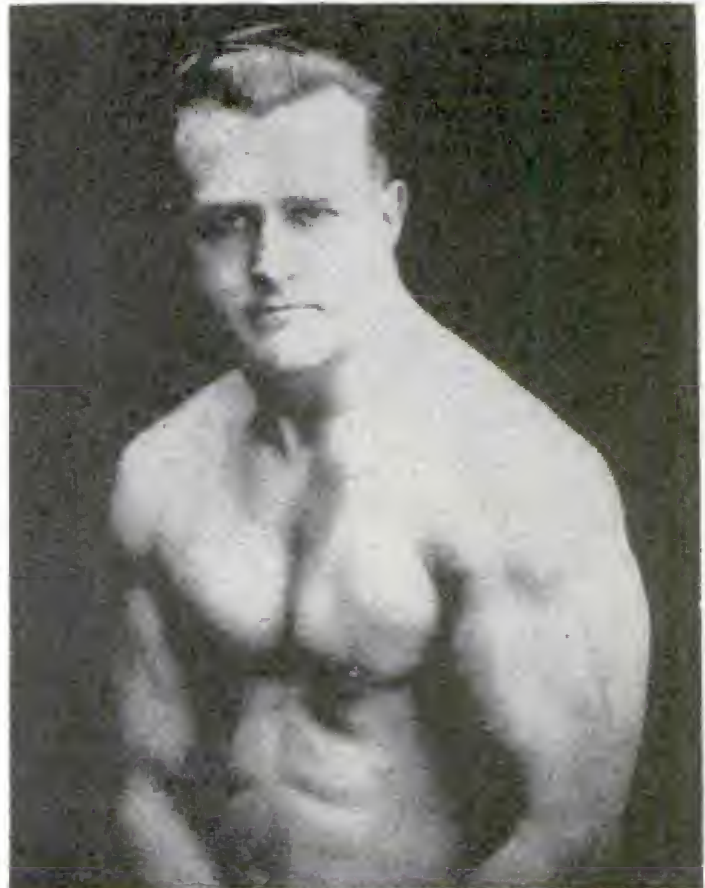
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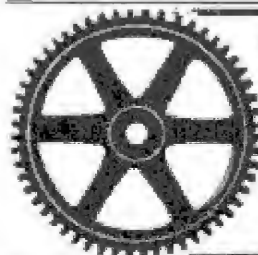
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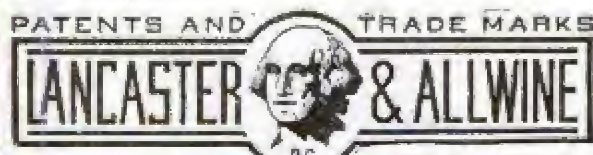
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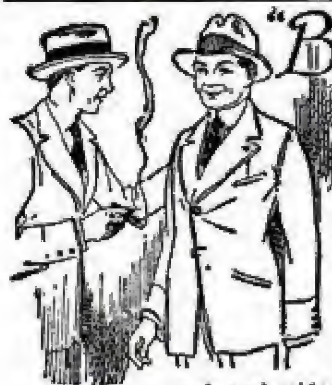
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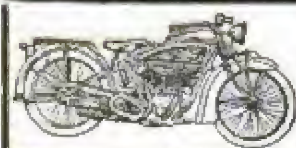
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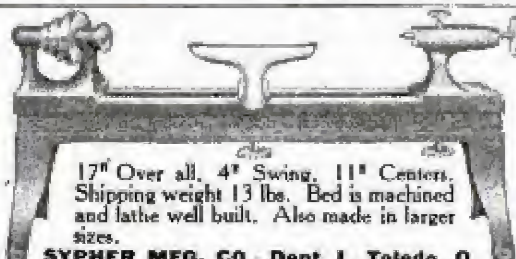
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A good 1/2 or 1 1/2 horse power motor for operating is easily obtainable. For drilling, be sure motor turns counter clockwise looking at exposed end of shaft. In ordering, state size of motor shaft.

Special Offer

Our Flexible Shaft Outfit regularly sells for \$40. As a special introductory offer from our factory to you, send \$5 with order, and pay postman \$20, plus postage on arrival. Satisfaction guaranteed or money back. Order direct from this advertisement.

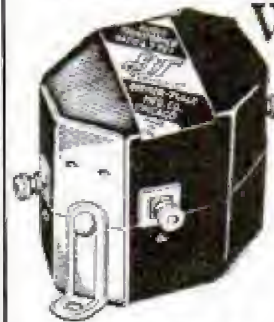
THE S. S. WHITE DENTAL MFG. CO.
(Industrial Division)
152 West 42nd Street, NEW YORK, N. Y.

ALL FOR \$25.00 COMPLETE



"The Best Transformer We Ever Tested"

says a leading
Laboratory



2.2 to 1, \$5.00
4.7 to 1, 5.75

Better audio amplification than you can secure in any other way—and without paying a premium.

Silent Socket

Only successful remedy for microphonic noises. Better than spring sockets—it absorbs vibrations. Put one on your detector and you won't know your set. Including Universal Socket..... **\$1.25**



BREMER-TULLY Mfg. Co.

532 S. CANAL ST.

CHICAGO, ILLINOIS

PACKARD

Prepaid in U. S.

\$7.25

FOREIGN
\$9.50



Weight 12 lbs.

SIZE:
26 in. by 10 1/2 in.

Lifting power of great strength operated by crank, holds up to 200 lbs. Tailboard has snap catches and chute. "Stop" and "Go" signals, nickel-plated Headlights and Hubs. Balloon tire wheels. Rubber tires \$7.00 per set extra. Fully guaranteed. Catalog of other trucks and moviegraphs upon request.

Libbey & Nichols, Dept. O, 100 Boylston St., Boston, Mass.



DIAMONDS

Here at 60% of Market Price

This snappy accurately cut diamond 7/8 less 3/32 ct. at \$82.50 among bargains in recent list. Many other big values in our lists. Buy here! Prices based on loan values, not market values. This 75 year old diamond banking firm has thousands of unpaid loans and other bargains. Many from big cash deals direct with European Diamond Cutters. Must sell NOW to get back our cash.

Why Pay Full Prices

Any diamond sent for absolutely free examination at our risk. No obligation. No cost to you.

Send for Latest List

Describes Diamond Bargains in detail, gives guaranteed loan values. Explains unlimited exchange privilege. Write for list today. Send NOW.

JOS. DE ROY & SONS
1940 De Roy Building
Pittsburgh, Pa.

Only Opposite Post Office

Write Today for List of Diamond Bargains

This Ring \$52.50
7/8 - 1/2 Carat
Accurate
ly Cut

LEPAGE'S mends for keeps



COMPARED to the value of the article mended, the cost of the glue you use is practically nothing. Then while you are about it, why not use the best glue—LePage's? Have the satisfaction of knowing that the article is mended for keeps and that it won't come apart in a little while and have to be mended over again. Insist on LePage's.

LEPAGE'S GLUE

MOVIES Believe the Bible

See What It Teaches

We sell wonderful religious movie films and real movie machines—so you can show movies at home. Some movie machines as low as \$3.75—others higher. Also fine assortment of comedy, western and feature films with an exchange service for home users.

Write for Big Free Catalog

PARAMOUNT MFG. COMPANY Dept. MB
Boston, Mass.

NEW MARVELOUS ONE-MINUTE CAMERA

Takes and finishes pictures inside the camera in one minute. Agents wanted. Exclusive Territory. Make money selling these wonderful cameras or taking photos or both. Six different models. Phones 4x5, 3 1/2 x 5 1/2, 3 1/4 x 4 1/4, 2 1/2 x 3 1/2 and 1 3/4 x 2 1/4 inches. No experience necessary. Any one can operate these cameras. Write today for special offer.

CROWN MINUTE CAMERA COMPANY, Dept. 940, NORWALK, CONN.

THIS GREEN LINE TOOL CASE

KEEPS TOOLS SAFE
—ALL IN ONE PLACE

ONLY
\$4.95

Good tools deserve good care. Green Line is complete with 6 different types and sizes for machinists, carpenters, radio installers and set builders, pattern makers, electricians, garage and repair men, etc.

General Tool case pictured is light, sturdy, handy, especially adapted for Home or Shop use. Weighs only 7 1/2 lbs. yet measures 8" x 8" x 20". Made of cypress, covered with olive green metal with brass corners, bolts and lock, large tray and strong handle. If your dealer can't supply you, sent direct, prepaid upon receipt of price \$4.95, West of Rockies \$5.45. Order at once or send for catalog of complete line.

GREEN-CASE, Inc., (Tool Case Division), Racine, Wis.



FAST CLEAN CUTTING TOUGH AUGER BITS

An old carpenter very aptly summed up the reasons for his preference for Irwin Auger Bits.

He said, "They cut fast, they cut clean clear through, and they are the toughest, best edge holding, wear resisting bits I ever used." What more could be asked of any Auger Bit?

Every man should have a complete set of Irwin Auger Bits. The time they save and the convenience of having the right bit for every job soon repays the small cost.

Ask your hardware dealer to show you Irwin Auger Bits in sets.

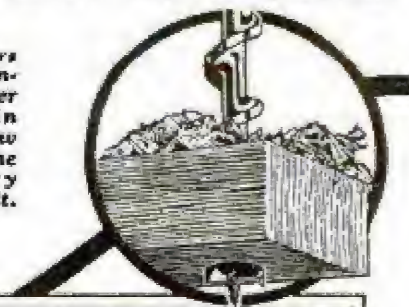


Illustration shows the Carpenter Set and Borecase

Irwin Home Set, 6 bits and case	\$3.50
Irwin Handy Set, 10 bits and case	5.50
Irwin Carpenter Set, 13 bits and case	7.25

THE IRWIN AUGER BIT CO., Wilmington, Ohio

Hardware dealers everywhere sell genuine Irwin Auger Bits. The Irwin mark shown below is stamped on the shank of every Genuine Irwin Bit.

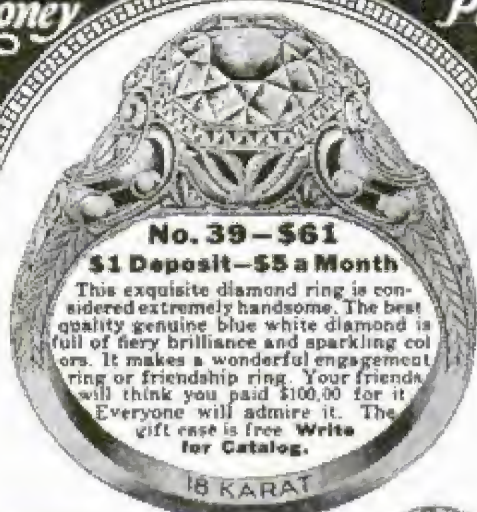


The IRWIN Bit

REG. U.S. PAT. OFF.

DIAMONDS WATCHES & JEWELRY 12 MONTHS TO PAY

Send No Money Pay The Post Man



No. 39 - \$61

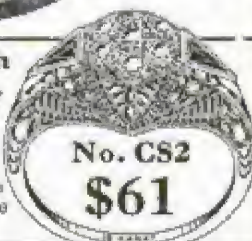
\$1 Deposit - \$5 a Month

This exquisite diamond ring is considered extremely handsome. The best quality genuine blue white diamond is full of fiery brilliance and sparkling color. It makes a wonderful engagement ring or friendship ring. Your friends will think you paid \$100.00 for it. Everyone will admire it. The gift case is free. Write for Catalog.

18 KARAT

\$1 Down: \$5 A Month

Great big cluster of seven sparkling, brilliant blue white, specially selected diamonds set in solid platinum in this handsomely engraved 18 kt. solid white gold ring. Two triangular, dark blue sapphires give the proper touch of style. It looks like a 2 carat solitaire worth \$1,000.00.



No. CS2
\$61

FREE

Every purchaser who answers this advertisement will receive a valuable premium. The premium list will be sent as soon as we receive coupon.

No. 8 \$22 \$1 DEPOSIT
\$1.75 A MONTH
ELGIN OR WALTHAM



Man's full 12 size, open faced model, fancy engraved watch with your choice of either of the world-famous Elgin or Waltham movements. They are cased in this handsome gold filled case which will wear like solid gold. The Waltham and Elgin movements are positively guaranteed both by the factory and ourselves. They are accurate time keepers. FREE: We will give away, absolutely free, a handsome gold filled chain and knife to match. They come in a fine gift case, and make an unexcelled present.

STERLING DIAMOND & WATCH CO., Inc.
1540 Broadway Dept. P-2085 New York

TEAR OUT & MAIL

STERLING DIAMOND & WATCH CO., Inc.
1540 Broadway, Dept. P-2085 New York, N. Y.

- ☐ Please send it to me by parcel post C. O. D. and I will pay the small deposit to the mailman when he hands me the package.
- ☐ I enclose \$..... as a deposit. Please mail the article to me direct to my home.
- ☐ Don't send the ring or watch, but mail a copy of your big free catalog to me, which shows thousands of diamond, watch and jewelry bargains for me to select from.

Name

Local Address

City and State

EDWARDS WILL SAVE YOU MONEY ON METAL ROOFS

We own our own steel mills, roll our own sheets, make them into high-grade REO METAL SHINGLES, Sidings, Ceilings and Roofings of every type and style for every kind of building. We control every operation from the raw material to the finished roof and we sell direct from our factories to the user. Not a dollar to divide with anybody but the customer! You get better value for less money.

OUTLAST THREE ORDINARY ROOFS

EDWARDS METAL ROOFS are weather-proof, lightning-proof, fire-proof! The galvanizing bends with the metal. No tools required.



LOW-COST ALL-METAL GARAGES

Any size. Any style. Portable. Ready to erect. Complete with frames, doors, sash and hardware. Ornamental, durable, economical. Blue-prints and complete instructions FREE.

Write today. Get our low prices and Free Samples. Ask for Roofing Book No. 150 or for Garage Book No.

THE EDWARDS MFG. CO.
100-150 Butler St. Cincinnati, O.



\$25000 A WEEK!

Made with the new and improved "Krispy" Potato Chip Outfit.

Potato Chips the lunch of the hour. Everybody is eating them. One stand in small building sells \$100 worth in a week. Think of it! Grocers, druggists, pool rooms, cigar stands, tourists' counters, parks—all sell thousands of packages. Supply them. Get the big profits. Chips easily, quickly made at home. No experience necessary. Write today. Get in a big profit fast growing business now.

SERVICE & EQUIPMENT CO., 905 Hoag St., Toledo, Ohio

THE WOTEN, GASOLINE ENGINE

2 CYCLE, 3-PORT

Aircooled and Watercooled. One-Half H. P. in five pounds. Handiest little engine ever made. Ideal wherever power is needed. Complete line of small gasoline and steam engines, dynamos, motors, batteries, battery chargers, etc. CATALOGUE FREE.

DYNAMIC MANUFACTURING CO.
First Nat'l Bank Bldg., Dept. 6 Chicago



Make Your Tool Kit Complete

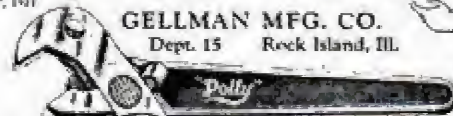
10
WRENCHES
IN ONE

Polly

No tool kit is complete without an assortment of wrenches. The "Polly" affords complete equipment with fewer wrenches at less cost. Entirely new principle, instant adjustment. Jaws cannot change adjustment while using. Light weight, more convenient handle; strongest wrench made. 6 in. 85c; 9 in. \$1.25; 12 in. \$1.75 or complete set, in kit, \$2.85. From your dealer, or sent prepaid on receipt of price.

Pat. 4
April
17, 1921

GELLMAN MFG. CO.
Dept. 15 Reck Island, Ill.



"Saws 25 Cords In 5 Hours"

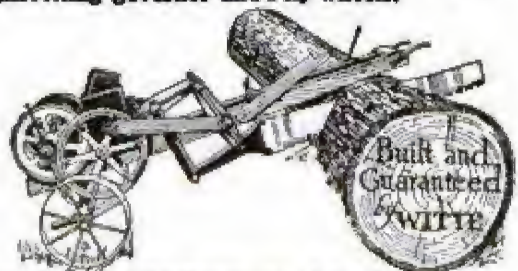
Any hustler can make big money with the one-profit WITTE Saw RIG—Ed. Davis sawed 25 cords in 5 hours—another user sawed 40 loads of pole wood in 3 hours. Hundreds of owners make \$3,000 to \$5,000 a year. Sold on Easy Payments.

**5 H-P.
3-in-1
Saw
Rig**



Cuts 60 to 70 Cords a Day Easy

A real all purpose outfit for farmers and men who make wood sawing a regular business. When not sawing you can fill silos, grind feed, shell corn, thrash and do other work. Easy to start at 40 below zero. Completely equipped with WICO Magneto, speed and power regulator, throttling governor and 2 fly wheels.



WITTE LOG & Tree Saw

Cuts down trees and saws them up FAST—one man cuts 10 to 15 cords a day—makes ties. The WITTE is easy to run and trouble-proof. Thousands in use. Powerful engine runs other farm machinery. Uses all low priced fuels.

EASY Pay only a few dollars down and take a year for the balance of low price.

PAYMENTS—MAKE YOUR OWN TERMS.

FREE Write today for full description and low price—no obligation. Or if interested, ask for our Engineer Pump catalogs.

WITTE ENGINE WORKS

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UTAH LOUDSPEAKER

Ours is the strongest guarantee! Use it 10 days. If not the finest you ever heard, return it and get your money. Dealers Everywhere.

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CHICAGO, ILLINOIS

SPORT BODIES for FORD and CHEV. 490 at \$34.50

Life-size paper patterns—You can build your own body at small cost.



**\$8 UP
UNDER
SLUNG
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We are manufacturers and our quantity production enables us to quote exceptional low prices. Our unique shipping methods save you 73% in FREIGHT CHARGES. Send at once for free particulars on Central Bodies. Our Book: "HOW TO BUILD A FORD RACER" sent anywhere on receipt of 25c in cash or stamps. **WRITE TODAY!**
Central Auto Supply Co. Dept. 120, Louisville, Ky.



The Bridge to Amplification Without Distortion

Daven engineers were pioneers. They blazed the way for others to follow. They designed and built the first Resistance Coupled Amplifier offered the public. They found resistance coupling in an experimental stage. They perfected it.

Daven Resistance Units, Amplifier Kits and Super-Amplifiers are accepted by the foremost authorities in Radio as standard. The Daven Super-Amplifier is for use in any known set or circuit.

A New Tube By Daven

To meet the exacting requirements of Resistance Coupled Amplification the Daven Radio Corporation has created a new product, the DAVEN HIGH MU VACUUM TUBE, Type MU-20. It is designed for one specific purpose only—to increase the amplification of the Daven Resistance Coupled Amplifier so as to exceed that of ordinary audio frequency coupling. The Daven High Mu is a 6 volt, 1/4 ampere tube with an amplification constant of 20. Daven Power Tube Type Mu-6 is recommended for the last or output stage of any set.

Resistor Manual

Manufacturers of high grade sets are turning to Resistance Coupled Amplification. The authority is *The Resistor Manual*. At your dealer's, 25c; or by mail, 30c.

Daven products are sold only by good dealers

"The Line of Most"

DAVEN RADIO CORPORATION

Resistor Specialists

NEWARK Reg. U. S. Pat. Off. NEW JERSEY

CLIP THIS COUPON



DAVEN RADIO CORPORATION
165 Summit St., Newark, N. J.

Please send me the following on Resistance Coupled Amplification.

CHECK ONE

... Resistor Manual. 30c is enclosed.
... Complete Catalog (free).

Name,

Address,

For Dealers: Send your letterhead or card and we will have our nearest distributor communicate with you.

THE BIG LITTLE THINGS OF RADIO



LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night

The very latest discovery in the scientific world. Hitherto, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crockery, Luminous Jewelry, etc. Small bottle, price 25c. Larger sizes, 50c and \$1 postpaid. **JOHNSON SMITH & CO., Dept. 471, RACINE, WIS.**

Serpent's Eggs

Box contains 12 eggs. When lit with a match, each one gradually inhales itself into a snake several feet long, which curls and twists about in a most life-like manner. Price per box, 10c postpaid, 3 for 25c.

CIGARETTE MAKER



Roll your own and save money. Makes them better and quicker besides saving more than half. Use your favorite brand of tobacco. Neat, useful and handy. Pocket size, weighs 1/2 oz. Made entirely of metal, nickel-plated. Price 25c postpaid.

MIDGET BIBLE

GREAT CURIOSITY Smallest Bible in the World. Size of a postage stamp. 200 Pages. Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Makes good money selling them to friends, church acquaintances, etc. PRICE 15c each, 3 for 40c, 12 for \$1.35, 100 for \$7.50. Also obtainable in Leather Binding, with roll edges. Price 50c each, 3 for \$1.25, \$4.50 per doz. Magnifying Glass for use with Midget Bible, 15c.

STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaid: 45 Bills 20c, 125 for 50c, or \$3.50 thousand postpaid.

Wonderful X-Ray Tube

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the leg in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. A mystery that no one has been able to satisfactorily explain. Price 10c, 3 for 25c, 1 dozen 75c. **JOHNSON SMITH & CO.**



Good Luck Ring

Quaint and Novel Design

A VERY striking and uncommon ring. Silver finish, skull and crossbones design, with two brilliant, flashing gems sparkling out of the eyes. Said by many to bring Good Luck to the wearer, hence its name, Good Luck Ring. Very unique ring that you will take a pride in wearing. **ONLY 25 CENTS.**

Address orders for all goods on this and opposite pages to

JOHNSON SMITH & CO.

Dept. 471

RACINE, WIS.

Also see Edition of our new 1925 CATALOG mailed on receipt of 25c. Handsome cloth binding. Only book of its kind. 420 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, interesting books, curiosities in seeds and plants, etc., unobtainable elsewhere. Remit by Money Order, Check, Cash, Stamps, etc. Stamps of foreign countries also accepted.

BLANK CARTRIDGE PISTOL

Protection against Burglars, Thieves & Dogs



Prices
50c
\$1.00
Post-paid

Well made and effective; modeled on latest type of Revolver; appearance alone is enough to scare a burglar. When loaded it may be as effective as a real revolver without danger to life. It takes standard .32 Cal. Blank Cartridges obtainable everywhere. Price 50c, superior quality, \$1.00 post-paid. Blank Cartridges, by express, 50c per 100. Holster (Cowboy type) for Blank Cartridge Pistol, 50c. **JOHNSON SMITH & CO., Dept. 471, Racine, Wis.**

BOYS! BOYS! BOYS! THROW YOUR VOICE

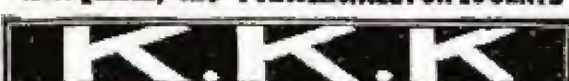


Into a trunk, under the bed or anywhere. Lots of fun fooling the teacher, policeman or friends.

THE VENTRILO

a little instrument, fits in the mouth out of sight, used with above for Bird Calls, etc. Anyone can use it.

Never Fails. A 32 page book on ventriloquism, the Ventrillo, ALL FOR 10 CENTS



Everything about the Ku Klux Klan told in a clear, fearless manner. Book tells all—How it started and was organized in 1871—The New Ku Klux Klan—How Organized—How Members are Enrolled—Oath of the Klan—Questions for Candidates—Creed—Objects of the Order—Obedience—Fidelity—Pledge of Loyalty—Ku Klux Klan and the Masons—The Jews—The Masons—Real K. of C. Oath—The Negro Ku Klux Klan, etc., etc. Latest and most complete book on the Klan published. Price 25c, Postpaid. Stamps or Cash

LOOK 35¢ LOOK

Wonderful instrument. Greatest thing yet. Nice separate articles in one. Everybody delighted with it. Odd, curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a Pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail, postpaid. **Only 35c or 3 for \$1.00**

25 CENTS BABY TANK

Goes backward or forward by steam power. Nothing toward Wind makes it go in a mystery. It crawls along, overcoming obstacles just like the larger Tanks. Performance of most amazing feats. Runs ten times longer than most mechanical toys. Hand-assembly. Runs oil and kerosene. Baked in natural colors. 25c postpaid.

Female SEX Male Sex Indicator

Hold the MAGIC INDICATOR over a man's hand—instantly it moves in a straight line, backward and forward. Hold it over a woman's hand and it describes a complete and continuous circle. The same action can be obtained over a letter written by a man or woman, etc. It is fascinating to behold. We have never been able to figure out how it's done, but we've never seen it fail. Many novel and entertaining feats may be performed with the Sex Indicator. For example, similar results can be obtained with animals, cats, dogs, rabbits, over birds, chickens, canaries, etc. Also used to predetermine the sex of chickens and birds, etc. In fact it is sold as a patented sex tester in Europe. Price 25c, or 3 for 85c, postpaid. **JOHNSON SMITH & CO., Dept. 471, RACINE, WIS.**

Exploding Cigarettes



JUST LIKE ORDINARY CIGARETTES. BUT SUCH REAL STARTLERS! The box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c per box.

Popular Watch Charms

15c
ONLY
3 for 40c; \$1.35 doz.

Very pretty little curiosities and decidedly novel. Fitted with Magnifying Lenses that enlarge the pictures to a very surprising degree. In fact, it seems almost incredible that a clear picture could be possible in such a small compass, and how sharp and distinct they show up when you look through. Comes in assorted views—Acrobats, views of Panama Canal, Lord's Prayer in type, etc.

Mystic Skeleton

A jointed figure of a skeleton 14 in. in height, will dance to music and perform various gyrations and movements while the operator may be some distance from it. **10c & pd.**

NEW BOOK ON ROPE SPLICING

Useful Knots, Hitches, Splices, etc.

A most practical handbook giving complete and simple directions for making all the most useful knots, hitches, rigging, splices, etc. Over 100 illustrations. All about wire rope attachments, lashing, blocks, tackles, etc. 37 Heraldic Knots illustrated. Of great value to mechanics, riggers, carpenters, boatmen. Price 20c postpaid.

MAGIC FLUTE

Wonderfully Sweet Toned and Musical

The Magic Flute, or Harmonatone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is as charming as it is surprising.

Post Paid 25c

THE TEDDY CAMERA



Takes and Finishes an Excellent Photograph on a Card 3½ x 2 in One Minute

It is the newest method of photography in which skill and experience are not necessary. Not a plate nor a film camera, but a camera that produces the complete picture. Does not use either plates, film, or dark-room. All the troubles of picture-taking in the ordinary manner are swept away. It eliminates all the fuss and trouble and, above all, there is no waiting, for you actually see the finished picture in One Minute. You merely place the cards in the camera, press the shutter, drop the card into the automatic developing tank attached to the camera, and in One Minute you have a completed picture all finished and ready to show. It is so simple and easy that any child who can use its hands can take good pictures. The camera weighs little more than half a pound, and measures about 4½ x 3½ inches, easy to carry about and always ready to take and finish a picture in one minute. The lenses of high grade, universal focus, needs no adjustment, and takes clear and brilliant pictures at any distance. The shutter works perfectly and responds to very slight pressure. It works in broad daylight. The Developing Tank is attached to the Camera and holds a single solution that develops, tones and fixes the picture in one minute with absolute certainty and with no care or attention on the part of the operator; it cannot be overdeveloped. Produces a picture 3½ x 2 inches. Send today and have the never-fading pleasure of making excellent pictures of your family, friends or neighbors, your home or your domestic pets. Price of Camera Complete with Developer and Package of Cards, ONLY \$2.50. Extra packages Sensitized Cards 15 cents per package; extra Developing Solution 25 cents. All prices are postpaid to any address in the world.

\$2.50

Every Boy His Own Toy Maker



Greatest boys' book written. Tells how to make a Pinhole Camera, a Canoe, model Railroad, a Telephone, Boomerang, Telegraph, Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Boat, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages, 150 illustrations. PRICE, 10c postpaid; 3 for 25c.



JAPANESE ROSE BUSHES

The Wonder of the World

Japanese Rose Bushes bloom all the year round. Just think of it. Six weeks after planting the seed, the plants will be in full bloom. It may not seem possible, but we positively guarantee it to be so. They will bloom every ten weeks, Summer or Winter, and when three years old the bush will be a mass of roses, bearing from five hundred to a thousand roses on each bush. The flowers are in three shades—white, pink, and crimson. The plants will do well both in and out doors. We guarantee at least three bushes to grow from each packet of seed. Price, 10c packet, 3 pkts. for 25c postpaid.

Novelty Badges



Kissing Permit 10c. Garter Inspector 10c. Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. 10c. each badge, 3 for 25c, or 75c per doz. postpaid.

False Mustache

Here you are, boys! Just the thing for a little harmless masquerading. On and off in a twinkling. Lots of fun putting one on in a crowd of friends. The sudden transformation is astonishing. Fine for private theatricals, minstrel shows, chautauks, tableaux, etc. Change your appearance beyond recognition. PRICE 10c, 5 for 50c postpaid.



Microphone Transmitter Button



You can easily make a highly sensitive microphone by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can install an outfit in your home and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit was used by secret service operatives during the war. It is being used on the stage. It is ultra-sensitive and is the greatest invention in microphones. You can mount the button almost anywhere—on a door, on a wall, on a pipe, on a radiator, on the wall behind a picture frame, etc. Button is so light and small it cannot be detected. Persons can be overheard without suspecting it. You can listen in on conversations in another room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard hundreds of feet away. Button may be used to renew telephone transmission; often makes an old line talk as if it were something else. The ideal microphone for radio news service; very sensitive. Amplifies radio signals. Countless other similar uses will suggest themselves. Experimenters find the Button useful for hundreds of experiments along the lines of telephony, amplifiers, loud speakers, etc. Many fascinating stunts may be devised, such as holding the button against the throat or chest to reproduce speech without sound waves. \$5.00 is given to anyone who sends in a new suggestion for the use of the Button, including the nature of the use and its suitability for use in their literature. PRICE \$1.00 POSTPAID ANYWHERE.

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Apparatus and Directions for a Number of Mysterious Tricks Enough for an Entire Evening's Entertainment

ANYONE CAN DO THEM 75c



It is great fun mystifying your friends. Get this Magician's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for seven dramatic tricks, including: The Disappearing Rose, that, when placed on the lapel of your coat, vanishes from sight at will; the Magic Vase and Ball Trick in Wooden Ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket; The Magic Box with which you can apparently put your fingers almost in two; the Wonderful Card Trick in which a card is placed in an spectacle, and when opened entirely, or can be made to change into a coin of another denomination; The Famous Disappearing Penny Trick; The Glass Goblet and Vanishing Coin Trick in which a coin is dropped into a glass of water, and when the water is poured out the coin has vanished. With the tricks described above we send full printed instructions for performing each trick, so that anyone can readily perform all the tricks to the great amusement of their friends or the public. Any boy of brilliant intelligence, with this Cabinet of Tricks in his possession, can give a packed entertainment out inferior to any regular magician. Besides the tricks contained in the Cabinet, there are many other tests and illusions fully explained with full printed instructions, for which you easily make or possess the necessary apparatus. This wonderful Cabinet of Tricks for ONLY 75 CENTS POSTPAID TO ANY ADDRESS.

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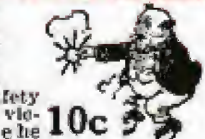


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Harley-Davidson The Motorcycle

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See our other Ad on Page 123

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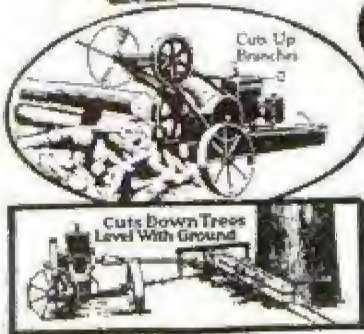
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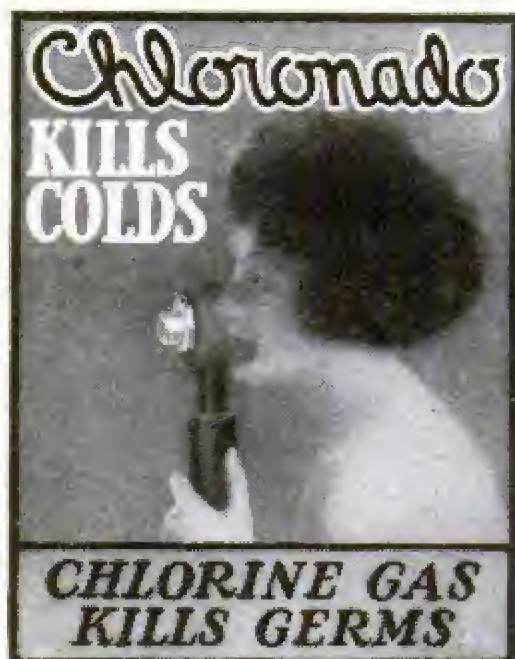
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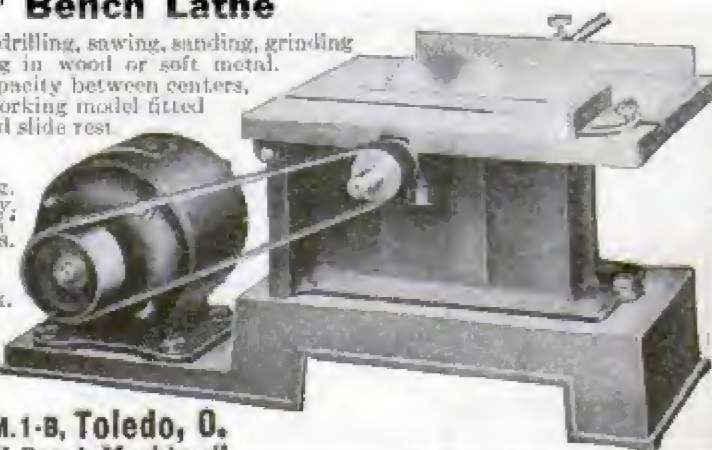
Does ripping, raftering, grooving, sanding, grinding and drilling with ease and accuracy. Table 10"x13". Saw 7" diameter cuts 2 1/2" stock. Dadoes 1/2"x3/4" deep. Cuts mouldings.

14" Band Saw

Table 12"x14" tilts 45 degrees. Saws 7" stock. Use blades 3/16" to 1/2" wide. Bronze bearings. All Boice machines driven by 1/4 to 1/2 H.P. Motor attached to light socket. Machines sold with or without motor.

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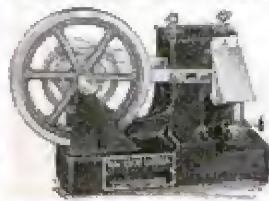
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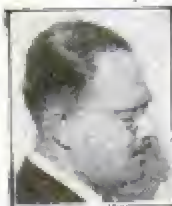
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Special Low Price

THIS IS THE OUTFIT —

If soldering is troublesome or complicated to you it is because you have never used real professional tools. With this big complete outfit you can do real expert soldering equal to any! Radio and electrical connections, mending leaky pots, pans, water pipes and auto radiators. There are hundreds of jobs you can do around the house, shop and office. This big set will save many times its price on your first two jobs. Just think how often you have badly needed a good soldering outfit. Every mechanic has. And every lover of good tools should own one. Formerly the price of a professional outfit like this has kept most folks from buying one. But now you need wait no longer. Here is everything you need: One "genuine" **JIFFY BLOW TORCH** (Self Blowing), A **BIG HEAVY DUTY PROFESSIONAL SOLDERING IRON RACK**, One **Collapsible, Adjustable ALL-STEEL SOLDERING IRON RACK**, A **BIG BOTTLE OF GENUINE JIFFY FLUX** (for soldering all metals), **PROFESSIONAL SOLDER** (enough for 50 jobs), one combination **JOINT CLEANER and WIRE SCRAPER** and complete instructions **HOW TO DO PROFICIENT SOLDERING**. There! Everything complete. No extra tools or accessories needed. Nothing more to buy. **A real \$5.00 Value.** It is almost unbelievable, but the **BIG BARGAIN PRICE is only \$2.50.** You, no doubt, wonder how such tools can be offered at such a **SMALL PRICE.** Read on!

Absolutely FREE

To each of the first 500 persons who mail the coupon below we will send one genuine **GRIP-IT SCREW-DRIVER** **ABSOLUTELY FREE.** This newly invented tool sells for 75c at leading hardware stores. We have a good reason for **GIVING IT TO YOU FREE.** Read the description and reason in the center of this page.

THIS GRIP-IT SCREW-DRIVER (8 in. overall) IS

Free!

(Worth 75c in Any Hardware Store)

I AM FREE

Yes — absolutely free. Because when your friends see yours they will want one, too. You can readily see where it pays us to introduce the **NEW GRIP-IT Screw-Driver** in this manner. Just the thing for handy men, electricians, mechanics — **EVERYBODY.** Heavy, sturdy, made to last, it grips the screw as shown in sketch. Won't let go until you release. Lock with thumb. Can be used with one hand only. Drives screws in tight places where an ordinary screw driver won't work!



Thousands of these **NEW GRIP-IT Screw Drivers** will be sold to people who see them in use. You can make big money selling to friends. In our stores having for mechanics one of our salesmen sold ten **Screw-Drivers.** They sell like hot cakes everywhere — 100% profit for our money making plan.

Drives wood or machine screws. Can be used as regular screw-driver.



Above is an actual photograph of the complete set (reduced many times because of limited space). The **Blow Torch** furnished is guaranteed to be a genuine "**Jiffy**" — the torch you have heard repairmen praise so highly. It is self-blowing, develops an intense blue-hot flame in but a few seconds and burns for hours — without attention — on one filling of fuel. Cheap to operate. Efficient to use. Guaranteed to be **ABSOLUTELY SAFE!**

Radio Fans!

You can build the most complicated sets quickly and easily. You can startle your friends and make your work in demand everywhere. Why is one set of the same design better than another? Why has one greater volume, distance and selectivity? Look into any high-grade factory-built set and you will discover the answer. You will see only good, solid "loss proof" connections. Radio engineers know the value of professional soldering. They know where the greatest chance of loss lies. Some fellows don't realize this, and that's why so many poor sets are built. You can start **RIGHT NOW** to build sets better than those of any of your friends. Good workmanship is all you need — and that means "**professional**" soldering. Get **BIG COMPLETE SOLDERING OUTFIT** at once!

Just mail the coupon — that's all!

How We Can Do It!

Good soldering tools have to be made to withstand all kinds of heavy abuse as well as intense heat. For this reason copper, steel and brass are largely used. During the slump in the stock markets last spring we purchased large quantities of these necessary materials at ridiculously low costs. And now when prices are up sky-high, we have the material we bought then. Our big factories are working night and day, and the result is we can offer a bargain that can not be beat anywhere.

ONLY 500 SETS WITH FREE OFFER

DON'T WAIT! DON'T DELAY! Be one of the lucky ones. Send the coupon right **NOW** and get the screw-driver **FREE!**

SEND NO MONEY

Apex Stamping Company, Riverdale, Illinois

RUSH me the **BIG COMPLETE SOLDERING OUTFIT** and (if this is one of the first 500 coupons you receive) **INCLUDE THE GRIP-IT SCREW-DRIVER ABSOLUTELY FREE.** I agree to pay postman \$2.50 plus a few cents postage, upon arrival. There are no further obligations on my part.

Name

Address

City..... State.....

(PM-Jan)

GENUINE Sent for DIAMOND RINGS \$2⁰⁰

\$2.00 Brings the Most Sensational Price Smashing Diamond Ring Offer Ever Made

Each of these rings is set with guaranteed, perfect cut, blue-white, fiery diamond of first quality; mountings are of 18 kt. white gold, hand engraved in the latest designs.



Ten Days Free Trial

Simply send \$2.00 and your choice comes to you all charges paid. If for any reason whatsoever you are not satisfied at the end of ten days, return the diamond ring to us and your deposit will be refunded. A legal bond as to quality and value accompanies each ring. After trial pay balance in 12 monthly payments.

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Most complete jewelry catalog ever published of diamonds, watches and jewelry



—newest designs at lowest prices. A full year to pay for everything you order from our \$2,000,000 stock.

Established 1895

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ROYAL DIAMOND & WATCH CO.
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Poultry Miller's American Guide

Tells all about chickens—care, feeding and raising for profit. Also describes IDEAL INCUBATORS, Hot Water and Electric IDEAL BROODERS—Coal and Oil Burning—Baby chicks, Eggs for Hatching. Special LOW PRICES

FREE
J. W. MILLER CO., Box 12, Rockford, Ill.



BETTER HEAT EASIER COOKING CHEAPER

THAN COAL OR WOOD

If you're interested in cheap fuel and more efficient heat, write for free folder on the

HOME ECONOMY OIL-GAS BURNER

Turns low cost kerosene or furnace oil into gas. Simple new principle burner that cannot clog with carbon. A control valve makes it the most efficient on the market. Can be installed by anyone. Fits any stove or furnace. Simple in operation. Objectionable noises eliminated. Entirely different from others. Gravity outlets for stoves or ranges, \$20. Pressure outlets for furnaces, \$35.

Wonderful opportunity for agents and distributors.

HOME ECONOMY BURNERS, Inc.,
600-604 Keith Theatre Bldg., SYRACUSE, N. Y.



I Averaged \$20.77 profit PER DAY for 217 Days

As
proved
by
Under-
writers

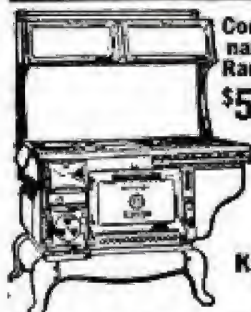
**Any
MAN
can sell
them**

Any MAN can sell them. Says L. D. Payne, Frank DeFries made over \$325 profit in one day. Stoddell and Viles sold over \$25,000 in 2 years. G. Howard earned \$100 in one day. F. E. Mendenhall worked half time and made \$100 a week. W. E. Findlay ran up his commissions in a few months from \$100 to over \$500 per month. Every Home, Auto Owner, Store and Factory a Live Prospect—Keston, Howard, and others, never sold Fire Extinguishers before. Our special training course starts you on road to success first day. If now employed, we can show you how to make big money during spare time. No Experience Necessary. Get our new Sales Plan—find out how to make real money. Territory going fast—write today!

THE FYR-FYTER CO.,

134 Fyr-Fyter Bldg., Dayton, O.

Save 1/3 to 1/2 AT FACTORY PRICES



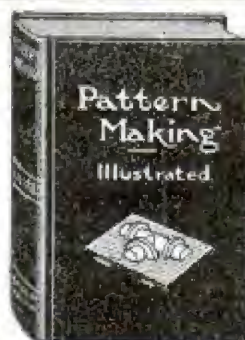
**Combination
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This new FREE book Quotes you lowest factory prices on Quality heating stoves, furnaces, porcelain enamel combination ranges, coal and wood ranges and gas stoves. 200 styles and sizes. Cash or easy terms—no less than \$3.00 monthly. 30 days FREE trial; 90 days approval test. 24 hour shipments. 500,000 pleased Kalamazoo customers. Makes \$25 to \$75 saving by sending postal for FREE book today.

Kalamazoo Stove Co., Mfrs.
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Kalamazoo, Mich.

**"A Kalamazoo
Trade Mark
Registered
Direct to You"**

PATTERN-MAKING for Those Who Should Know



Compiled by G. H. WILLARD, a pattern maker of many years' experience, for those who wish to increase their pay—or those who wish to enter this well-paying occupation. Filled to the covers with helpful shop-kinks and actual working information. Practical instructions written in plain language, which anyone can easily read and understand. Learn at home—in your spare time. Bound in cloth, 224 pages, 312 illustrations, diagrams and working drawings, etc.

Tells About Pattern making as a trade—The Tools—Woods—Circular Saw—2 chapters on Machine Tools—3 chapters on Simple Tools—Crooked Patterns—2 chapters on Large Pattern Work—Cross-Head Guide patterns—Sweep work—Pipe work—Stove pattern work—Molding—Machine Work—Molding Pattern Work.

CORE MAKING AND MOLDING

Part II explains the simple and complicated problems in core making and molding which every good pattern maker should know. **Tells about**—Core making, simple and complex—principles in Molding—Loam Patterns—Loam Molds.

Everyone following this trade or intending to enter it should have this remarkable book. The price is so low that anyone can afford to buy it. Those who have it, wouldn't be without it.

SEND NO MONEY Just write a postal. Pay

postman postage and \$1 when he hands you book.

POPULAR MECHANICS PRESS

200 E. Ontario St., CHICAGO

MADE FIRST—MADE BETTER—BUILDS MOST

*"I have been a
Meccano Fan
since I got
my first set"*
Jackie Coogan

Having a choice of all construction toys, Jackie selected Meccano, the original and "The Daddy of them all". More than once Jackie has been known to dash off between pictures to finish a Meccano model which he has designed himself.

You, too, can share in this Meccano fun. You can build towers, cranes, bridges—anything you can think of. It's as easy as building with blocks.

Made First—Made Better Builds Most

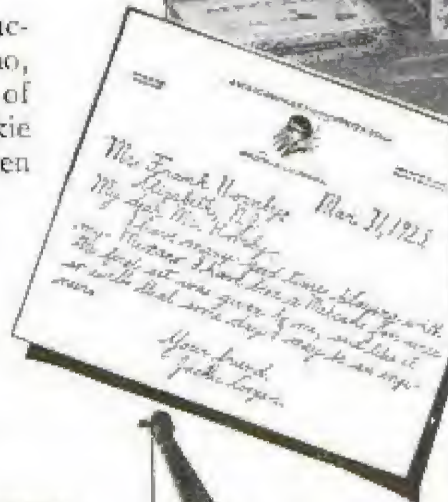
Meccano has such a great variety of parts—that's why it will build more models than any other toy. The parts are all made of shining steel and solid brass, and fit together perfectly. Other toys have copied some of these parts, but only Meccano has them all. Don't be fooled—to build *right* you must have the genuine

MECCANO

Engineering for Boys

In every Meccano outfit is a big book full of pictures of models. The fun begins as soon as you open your set. You can have a new toy every day for years without building the same one twice.

Yes, Jackie is enthusiastic about Meccano, and you fellows will be, too, when you get your outfit. Ask Dad to give you Meccano, and then—Oh Boy!



Some Exclusive Meccano Features

Only in Meccano can you get these parts

- 1 Heavy Perforated Steel Strips with smooth edges
- 2 Sturdy Angle Girders
- 3 Nuts and Bolts braced to prevent rust
- 4 Brass Wheels with solid brass hubs
- 5 Large Braced Girders
- 6 Solid Brass Gears the teeth are cut, not stamped
- 7 Curved Strips
- 8 Patented Cranks and Couplings
- 9 Triple-throw Eccentric
- 10 Powerful Geared Motors

Other toy parts may look like Meccano, but place them side by side and judge for yourself

Meccano Price List

No. 00	Meccano Outfit.....	\$1.00
No. 0	Meccano Outfit.....	2.00
No. 1	Meccano Outfit.....	3.00
No. 1x	(has Electric Motor)	5.00
No. 2	Meccano Outfit.....	6.00
	and up to \$45.00	

Send for these two FREE Books



"The Magic Carpet"—that carries you to the wonderland of Meccano joy and model-building. Full of beautiful pictures.

"The Jackie Coogan Book"—an interesting story of Jackie's visit to the Meccano Headquarters and what he saw there.

Send us your name and address, together with the names and addresses of three of your chums, and the two books will be sent to you absolutely free. Put No. 36 after your own name for reference.

Meccano Company, Inc., Div. H-1, Elizabeth, N. J.
In Canada—Meccano Ltd., 45 Colborne St., Toronto

AS EASY AS BUILDING WITH BLOCKS

Big 3-ft. Telescope

Makes people and objects miles away seem close. Brings new pleasures to home, farm, camp, travel, sport. See moon and stars as never before. New Ferry "Wonder" telescope has 5 sections—opens out over 3 ft. long, measures 12 inches closed. Big, strong and powerful, yet light, compact, easy to carry. Fully brass bound. Brass safety caps at each end to keep out dust. Powerful lenses.

Only

\$1.85

5 Sections
8-Power Lenses

Thousands Delighted!

"I am delighted with the 'Wonder' telescope. Today I have been watching submarines 3 miles off the coast."

Philip Brush. "I can see across the Mississippi 2 miles and see people fishing."—M. L. Thern. "I am nearly 80 years old, and if I could not get another would not take \$10 for it."

—A. R. Walker. "I can tell time on the church clock 5 miles away."—Edward Foster. "Could tell color of aeroplane 4 miles away."—Mrs. L. M. Yarbrough.

Send No Money

Sign and mail coupon below and Ferry Wonder 3-ft. Telescope with free Carrying Case will come by return mail. Pay postman special bargain price of \$1.85 plus few cents postage. Satisfaction guaranteed or your money back. Send coupon today!

Ferry & Co., 3224 N. Halsted St., Dept. 1771, Chicago

Send me 3-ft. Ferry Wonder Telescope and Free Carrying Case. I will pay postman \$1.85 plus postage on arrival. If I am not satisfied, you will refund my money.

Name

Address

City.....State.....

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Free to Motorists



Amazing New
Auto Invention
—the Marvelous
Wesco—a Boom
to Motorists!

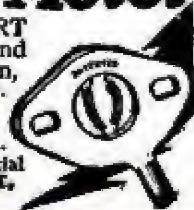
Makes Autos Run 60 Miles to a Gallon of Gasoline!

I don't care what mileage you are making—how many so-called gas savers you have used, I positively guarantee that unless Wesco cuts your gas bills—half or less, removes all carbon, increases power and pep and eliminates spark plug trouble it will not only cost you nothing but I'll gladly pay you for your trouble. Just send name, make and model of car and say "I want to try Wesco at your risk."

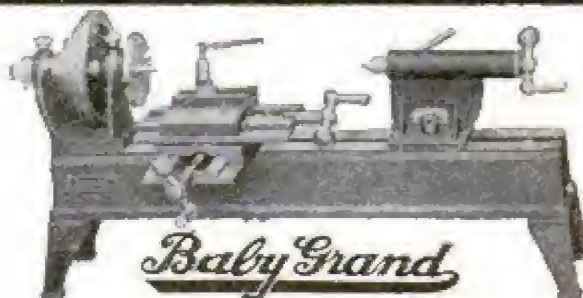
WESCO, 175 May Bldg., Sioux Falls, S. D.

Starts Cold Motor

INSTANTLY; new QUICK-START electric-heat primer, for FORDS and others. Principle adopted by Lincoln, Packard, Chrysler. Three devices in one. **GREATEST GAS SAVER YET INVENTED** Prevents carbon. Saves battery; saves oil. **AGENTS:** Quick-selling year-round article. Bigger margin of profit for you. Special **FREE Deal.** Write **W.W. KUTSCHE,** Inventor, Dearborn, Michigan.



Practical Tools for Practical Men



Baby Grand

Equipped with back-gear head or plain head as shown. Arranged for wood turning, metal turning or both. A practical machine for skilled mechanic or amateur: for shop or home. Made with same precision and quality materials as large lathes. Has 6" swing; 12" or 18" between centers; speed 180 to 1750 R.P.M. Quantity production explains its low cost.

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Both are thoroughly practical tools of high quality. Drill capacity 0" to 3/8" drills. Wide speed range. Comes equipped with chuck as shown. Grinder wheels 4" dia.; 1/2" face. Comes complete as shown.



Write today for prices and complete information on Baby Grand Tools.

The Watson Mfg. Co.

101 Watson Bldg.

Toledo, Ohio



Cabinet size
30" long, 14" wide, 30" high
Price
\$18.00

RADIO CABINETS Save Money

For your old set, or if you build a new one, buy one of these exquisite two-toned walnut console radio cabinets. Makes your old radio up to date. Just the cabinet for the Popular Mechanics circuit illustrated in November issue.

Biggest Bargain Ever Offered

These cabinets are made of selected gumwood, with 5-ply walnut veneer doors and top. Doors open to compartments for all batteries, wires, etc. Order direct from this ad. Send deposit of 25%—balance C.O.D. Satisfaction guaranteed.

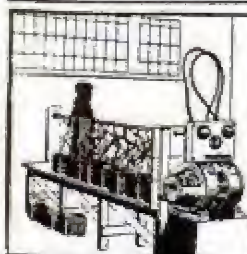
ORDER NOW!

LOEB EQUIPMENT SUPPLY CO.

618 W. Lake St., Dept. A, Chicago



Cabinet size
36" high, 30" long, 14" wide,
Panel size, 7" x 15" to 7" x 20"
Price \$21.50

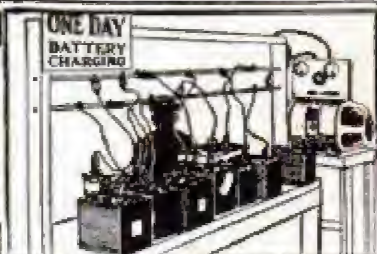


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Why not have a money-making One Day Battery Charging business of your own? Over 12,000 shops are making \$150 to \$300 every month selling One Day Charging. Every car needs it, especially in winter. Just \$35 cash completely equips your shop for HB One Day Charging. Small monthly payments on balance. 30 days' free trial in your shop on moneyback guarantee. No experience needed to operate an HB. Try its money-making possibilities in your shop at our risk. Write for free Bulletin 126.

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10 Days Free Trial

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Speed
Shop*
(Model
260)



In
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Six Complete Motor Driven Tools

The SpeedWay Shop Model 260 is a compact metal and woodworking outfit for mechanics, experimenters, householders, farmers and shop men. The power unit is our powerful back-geared electric motor.

A Complete Shop

Attaches to any lamp socket. All of the 23 items listed below are packed under pressed steel case with the lathe bolted to platform 25 in. x 6 in.

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|-----------------|-------------------------|--------------------------------------|
| 1. Lathe Bed | 9. Gauge Chisel | 17. 4-In. Wire Brush |
| 2. Tool Rest | 10. Universal Wrench | 18. Tool Case |
| 3. Tail Stock | 11. Base 25 in. x 6 in. | 19. Drill Handle |
| 4. Centers | 12. Saw Table | 20. Drill Bits |
| 5. Chuck | 13. 8-in. Circular Saw | 21. Nut and Washer |
| 6. Spur Center | 14. 2-In. Wheel | 22. Steel Cover |
| 7. Face Plate | 15. Arbor and Flanges | 23. The Well Known
SpeedWay Motor |
| 8. Parting Tool | 16. Cloth Buffer | |

All of best material and superior workmanship.

Only \$10.00 Down

Five minutes after receipt you can have the chips flying. Pay as you enjoy it. Use the SpeedWay Shop for pleasure or profit. This wonderful outfit gives you the following tools, all motor driven—

Saw, Lathe, Grinder, Buffer, Cleaner, Stationary or Portable Drill. Tools quickly interchangeable.

SEND COUPON TODAY

Free Job Sheets

We furnish free, Job Sheets explaining just how to make Furniture, Birdhouse, Toys, Trellis, etc. You can do Radio jobs; polish auto and golf clubs; and endless other things.

We want you to read what others say about SpeedWay Shop Model 260. We want to show you how it will profit you. Send the coupon TODAY. Every tool in the "Shop" is high grade, for regular work. A money maker for the small job man. Get full particulars. Send coupon TODAY.

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Electro Magnetic Tool Co.

Dept. 1351

1830 South 52nd Ave., Cicero, Ill.

Dear Sirs: Please send me full particulars about 10-day free trial on SpeedWay Shop Model 260.

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Address

City State

\$43⁴⁸ POSTPAID
Kit RK 9215
Range 3500 Miles

4-Tube ROBERTS

Superior to most other sets
REGARDLESS OF
NUMBER OF TUBES!



SEE WHAT YOU GET—BEST QUALITY

All parts highest grade—advertised, well-known, reliable, dependable—fully guaranteed by manufacturers and ourselves. Look at these brands. You cannot get a better kit! Pine 7x24x8 mahogany finish cabinet, drilled and engraved Bakelite-Directo panel, five-ply (laminated) baseboard, Sylvania Roberts' coils, 2 Hammarlund low loss variable condensers, 3 E-Z Taper vernier dials, Thorderson transformer, pair Modern push-pull transformers, 3 Percent rheostats, 1 Ball Bakelite low loss sockets, Jones Improved single-circuit jack, Jones Improved double-circuit jack, Cutler-Hammer Inductance switch, Smilcer filament switch, Electrode grid leak, Hilco grid condenser and mounting, 2 Hilco fixed condensers, Amplex grid-densifier, 7 Aristocrat binding posts, binding post strip, complete set "No-Sod-er" connecting wires, hardware, blueprint and instruction sheets. You can assemble in only three hours or so. Satisfaction positively guaranteed or money back.

List price, \$64.69; our regular catalog price, \$48.58—Special price to Jan. 31, only \$43.48. ORDER DIRECT FROM THIS AD—ON APPROVAL—NO MONEY IN ADVANCE—SHIPPED SUBJECT TO EXAMINATION WHEN REQUESTED—WE PAY TRANSPORTATION—24-HOUR SHIPMENT—SATISFACTION OR MONEY BACK (Foreign customers will please remit with order and include enough for transportation and insurance which we don't pay.)

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Filled with big bargains in Kits, Parts and Accessories. Send today!

RADIO SPECIALTY COMPANY, Kit Div. 1631, 245W, Greenwich Street, NEW YORK

STOP! See This! To get you started dealing with us, we have slashed the prices on this most popular kit. But your order will have to be sent by January 31 when our regular catalog price will again be in effect.

Combines principles of Reflex, Neutralization, Tuned Radio Frequency, Regeneration (without blooping), and Push-Pull Amplification. Smooth-working—easily tuned—non-howling—non-radiative—non-squealing. Guaranteed absolutely to give entire satisfaction.

See what Doubleday, Page & Co., through Mr. Arthur R. Lynch, Editor of their magazine, "Radio Broadcast," say about the Radio Broadcast's sensational 4-Tube Knock-Out Set developed by Walter Van R. Roberts:

"Tube for tube, dollar for dollar, result for result, we will stack it up against any receiver for home construction ever described by any radio publication and gamble that it comes out winner. It is the best we have ever seen—and we have seen and operated almost every type made and used during the past twelve years. It has pulled in forty-six stations on a loud speaker with two tubes, using an indoor antenna. Its signals have been heard through the air more than a quarter mile. It is not merely the best four-tube receiver, but the best by a very good margin."

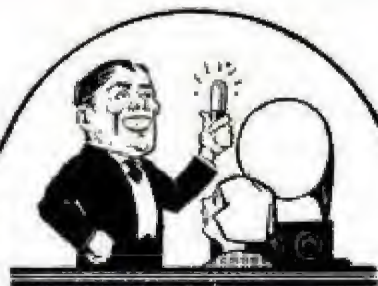
CUSTOMERS PRAISE IT!

Special Features Great volume—Utmost clearness—Sweetness of tone—Highly selective—Cheap to build—Easy to operate—Receives great distance—Does not radiate or cause squealing in your neighbors' receivers—Low cost of upkeep. The best 4-Tube set for home construction ever produced.

Our New Method of Wiring—Perfectly Simple—No Radio Knowledge Needed

"No-Sod-er"
MAKES SET-BUILDING EASY

No solder—No bare wires—No poor connections—No dissatisfaction. No tools needed except a common screw-driver and common pliers. All connections are made by the use of our flexible, insulated eyeletted connecting wire in place of bus bar or wire, and solder. And in a fraction of the time usually required when using the old fashioned way. And when the job is done it is neat and connections are tight.



**now we'll
have clear
music**



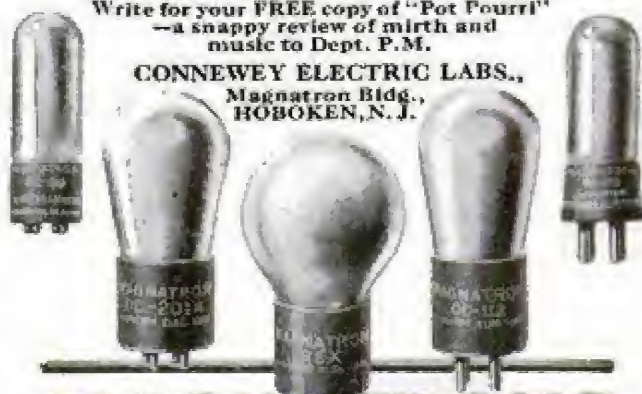
MAGNATRONS in your set will give sweet purity of tone—clear and complete rendition of all the wealth of overtones. Music and speech come from the loudspeaker of the Magnatron equipped set with rich fidelity and generous volume, recreating in your home the actual performance itself, whether it be ten or a thousand miles away.

Magnatrons are the product of the oldest exclusive makers of vacuum tubes. That, in a large measure, explains their excellence.

There's a Magnatron for every purpose. The DC-201A, the DC-199 (large or small base), the DC-120 (for super volume), and the Rex (for B eliminators) all list for only \$2.50 each.

Write for your FREE copy of "Pot Pourri"—a snappy review of mirth and music to Dept. P.M.

CONNEWY ELECTRIC LABS.,
Magnatron Bldg.,
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MAGNATRON

Complete factory stock for Pacific Coast carried at Pacific Radio Labs.,
256 S. Los Angeles St., LOS ANGELES, CAL.

"I MAKE \$25.00 A DAY SURFACING FLOORS"



"I am making \$25 a day and have made as high as \$40 a day with my American Universal Floor Surfacing Machine. I get plenty of work to keep my American Universal busy all the time."

WITH THIS MACHINE

Start in a small way and make big money. That's what Don Arnold did and thousands of others have done. Like you they read an advertisement just like this and accepted the wonderful opportunity to get behind an electrically driven American Universal Floor Surfacing Machine and build up a big profitable business of their own.

They are men from factories, stores, and offices, young and old alike, who were looking for a future and an opportunity to make real money. They are now making from \$25 to \$40 a day with one American Universal Floor Surfacing Machine, which does the work of six men and earns six men's pay. All started with just one machine, but many are now operating six or more machines and have become floor surfacing contractors on a large scale.

Every New Floor Must Be Surfaced Every Old Floor Needs Resurfacing

There is surfacing work to be done in every new and old business or residence in your vicinity. If you are willing to don a pair of overalls you can make from \$25 to \$40 a day every working day in the year—Winter and Summer, month in and month out.

NO EXPERIENCE NECESSARY

Any intelligent man can learn to operate the electrically driven American Universal Floor Surfacing Machine in a very short time. It actually does in a day the work of six men scraping by hand and does much better work than can be done by hand.

Write now for particulars. Let us tell you how you can become an American Floor Surfacing Machine contractor. You can secure this information absolutely free without any obligation on your part.

THE AMERICAN FLOOR SURFACING MACHINE COMPANY
523 So. St. Clair St. Toledo, Ohio



Let the American Scroll Saw

SOLVE YOUR SAW PROBLEMS

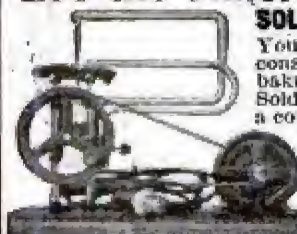
You will like its sturdy mechanical construction. It will saw wood, fibre, bakelite 1 in. and metal 1/4 in. thick. Sold also without motor. We carry a complete line of bench woodworking machinery.

For details write to

DELTA SPECIALTY CO.

Dept. No. A-110

858 Third St., Milwaukee, Wis.



Bodies of Rare Beauty for Fords

At Factory Prices!

\$22.75 and Up

Write for Circular A-2 showing this Model and others.
SPORT BODY WORKS
AURORA, ILL.



This model in grey prime, \$39.50

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SUCCEED With Your Own Products
Make them yourself. Formulas, Processes. Trade-Secrets. Modern master methods.
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Watch for announcement of Ives wonderful electric reversing locomotive.

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"KING" Saxophones

Built Acoustically Correct

KING Saxophones and Band Instruments are built to the most exacting standards in the industry. Every instrument is true to pitch, easy to play and has a beautiful quality of tone.

Free Trial—Easy Payments

You can have 10 days free trial to prove to your own satisfaction that a "King" is all that is claimed—and easy payments are extended in purchasing. Other instruments are accepted as part payment.

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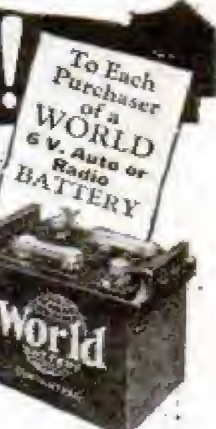


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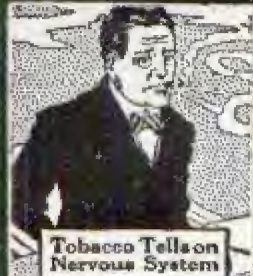
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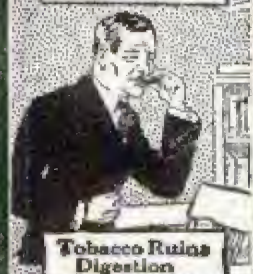
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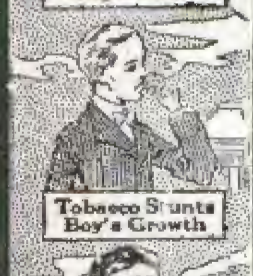
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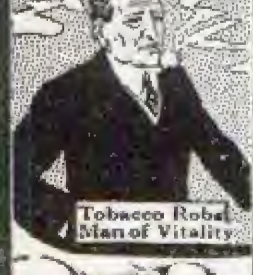
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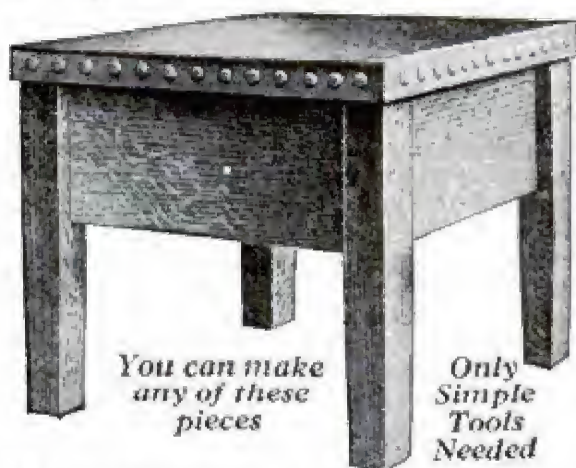
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Four-light chandelier
One-light bracket
Piano lamp
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Electric candle sconce
One-light bracket
Drop-light
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Reading lamp No. 2
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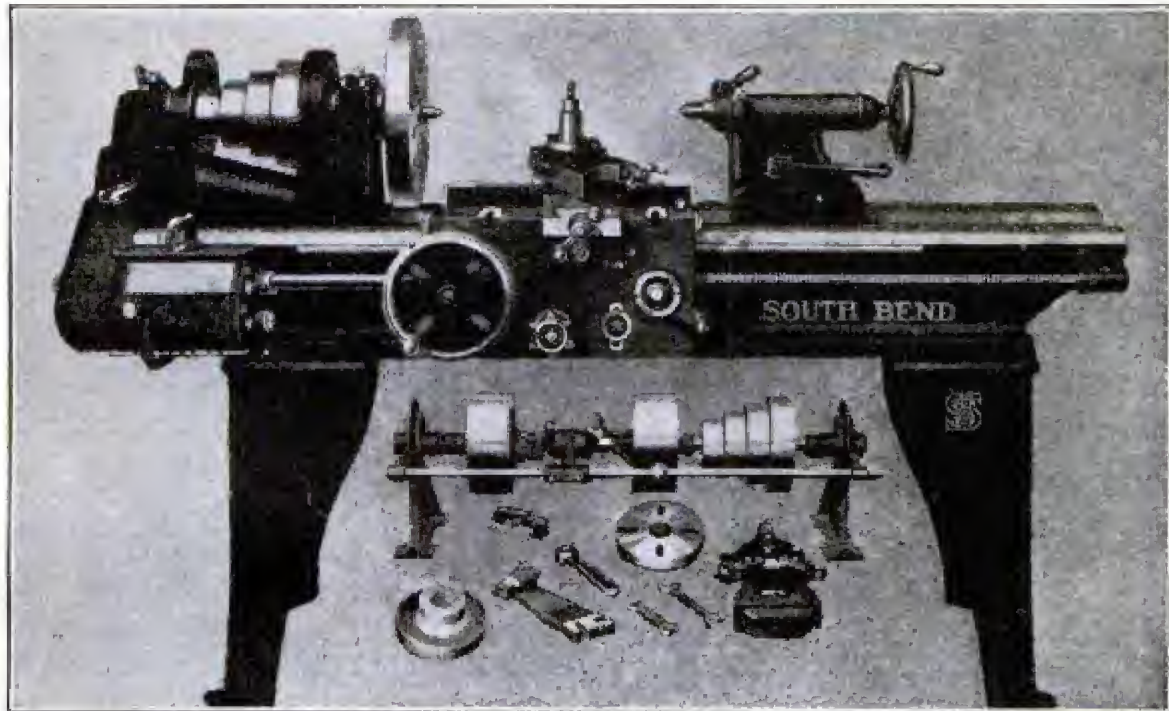
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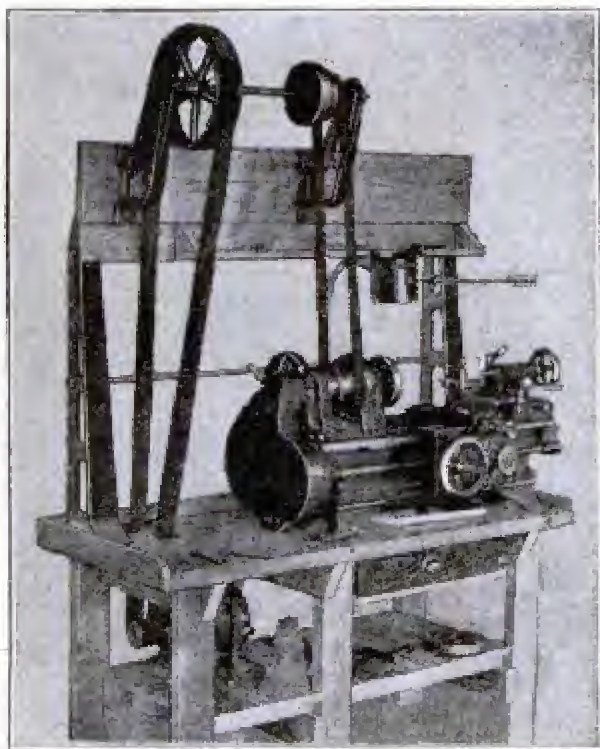
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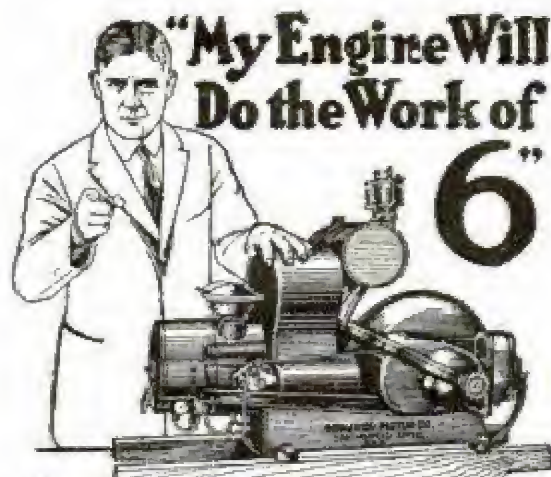
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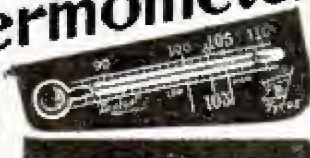
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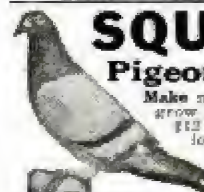
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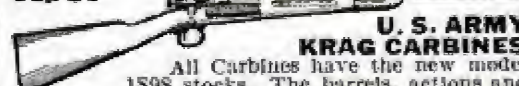
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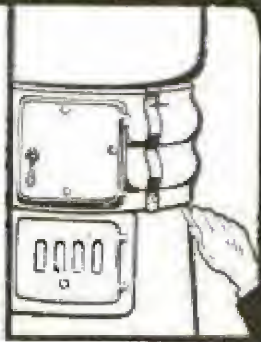
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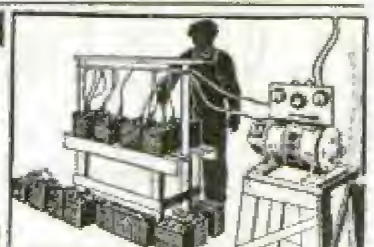


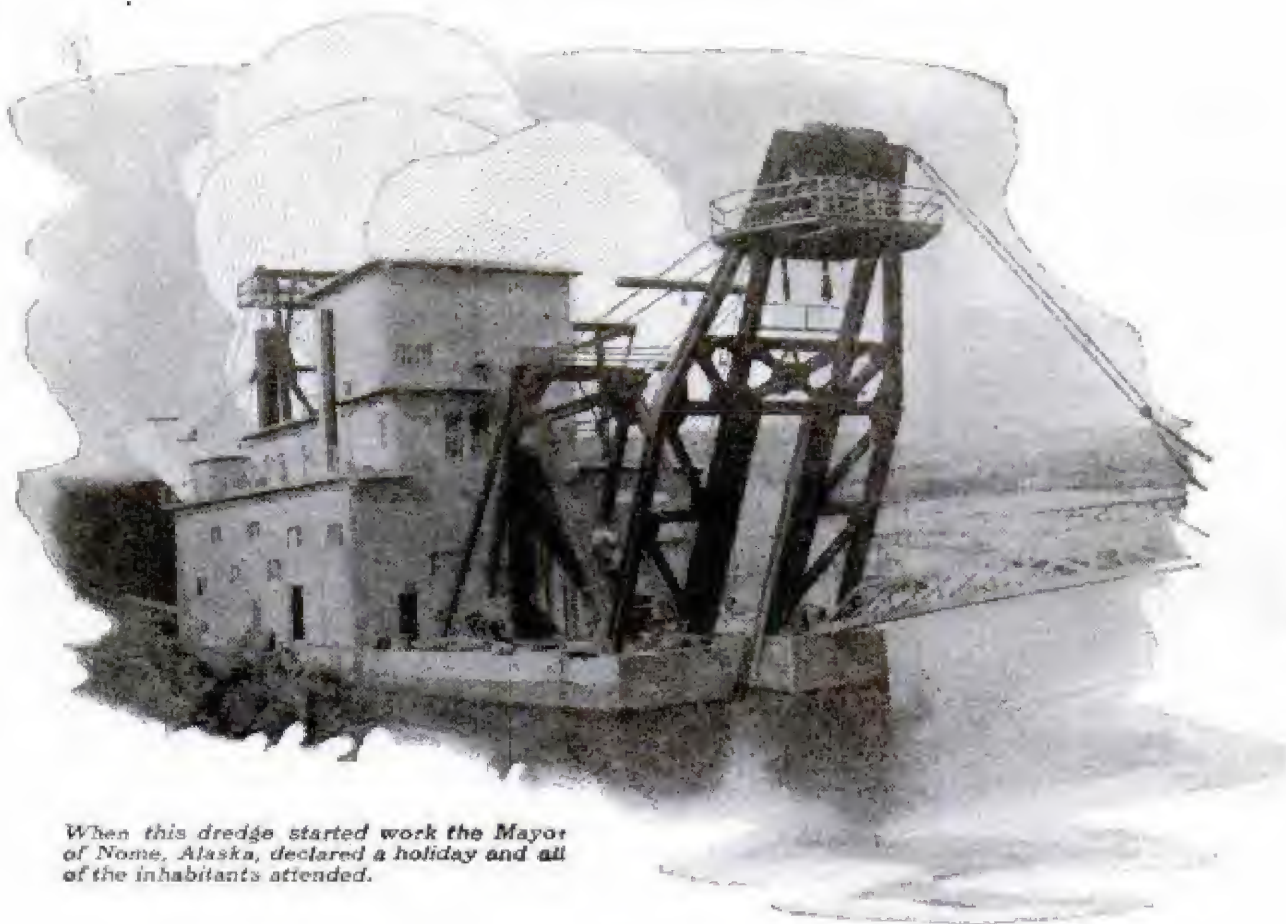
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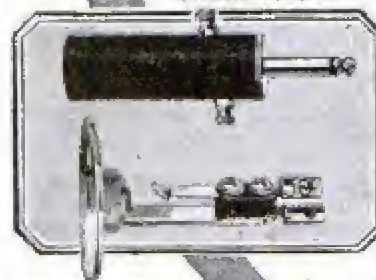
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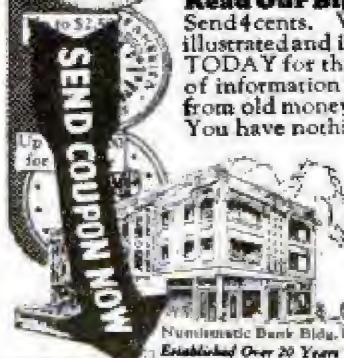
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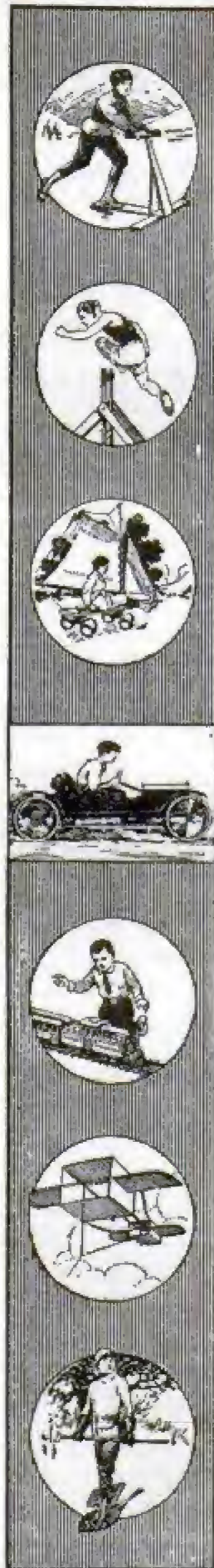
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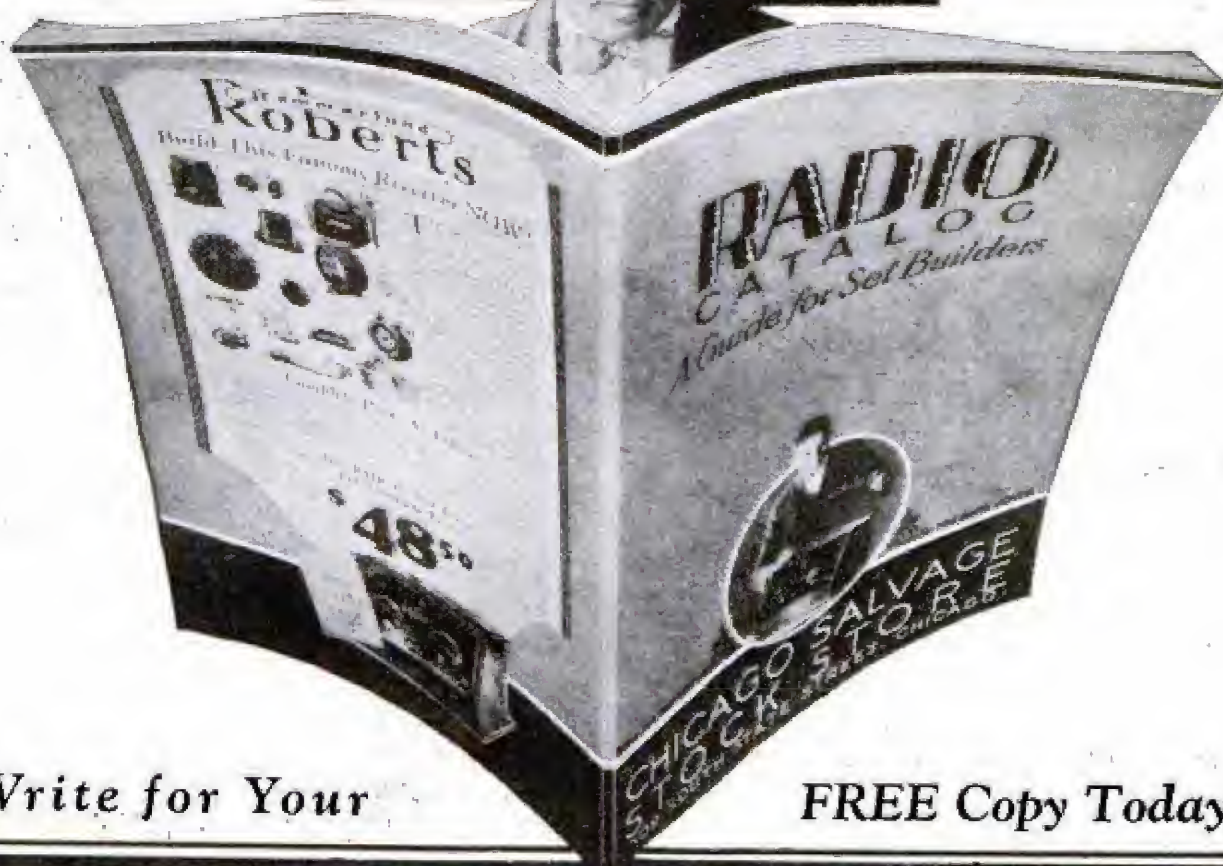
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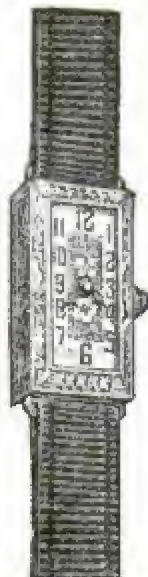
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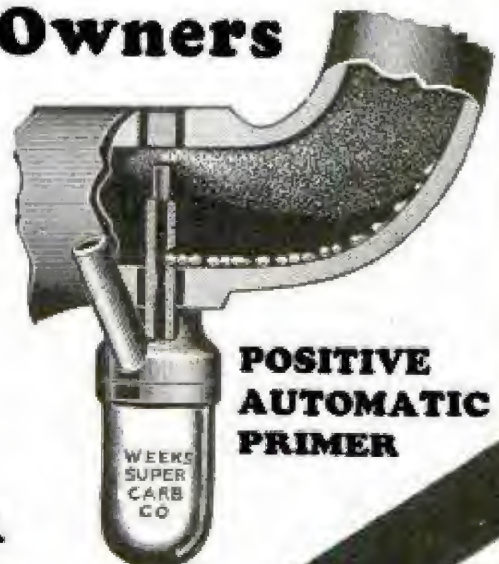
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